



Updating Nuclear Programs in Latin America after Fukushima (Argentina case)



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ARGENTINA NUCLEAR REACTORS

CNE NPP

RA-6 RR

RA-8 CF

RA-0 CF

RA-4 CFR

CNA-1 NPP

CNA-2 NPP*

RA-3 RR

RA-1 RR

*under construction



ARGENTINA



CNE
Embalse NPP
PHWR
In operation since 1983
648 MW_e
Natural uranium

CNA-1
ATUCHA 1 NPP
PHWR
In operation since 1973
357 MW_e
0.85% enriched uranium



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

ARGENTINA NUCLEAR PROGRAM

Present Situation

(Nuclear National Law 26.566 – Year 2009)

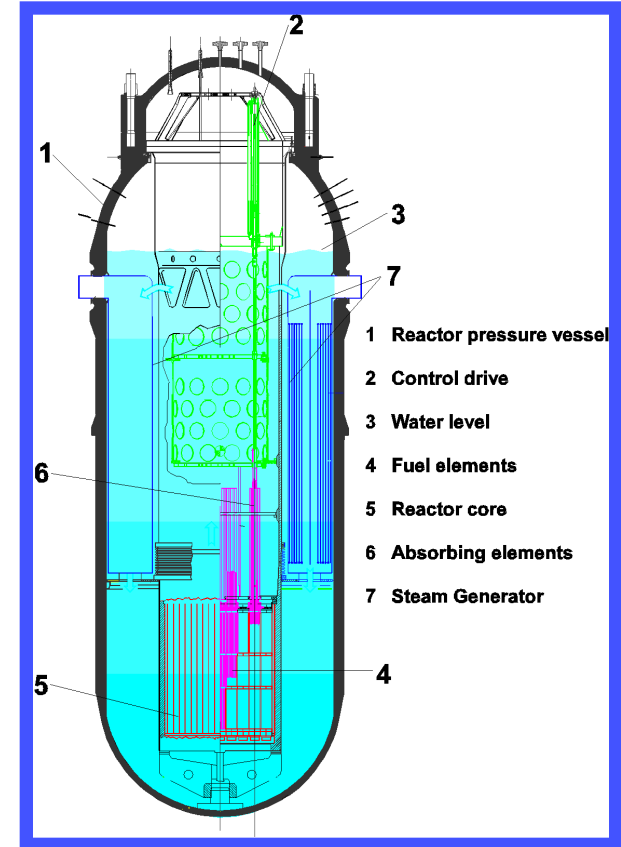


- ✓ Finish the partial build Atucha II NPP
- ✓ Life extension of Embalse NPP (+30 yrs)
- ✓ Build CAREM Prototype Small NPP
- ✓ Go on for 4th Argentina NPP (double or single NPP)



CAREM REACTOR

- ❑ Type: integrated PWR
- ❑ Designer: CNEA
- ❑ Power:
 - ❑ prototype 25
 - ❑ NPP 150 MW_e
- ❑ CAREM25 Prototype under construction
- ❑ Owner/Operator: CNEA
- ❑ Integral SG
- ❑ Enrichment 1,8-3,1%
- ❑ H₂O Cooling: Natural Circulation



CAREM is an innovative, simple and Small Nuclear Power Plant



Implication of Fukushima on Argentina Nuclear Program

- ✓ No direct implications of Fukushima on Argentina NPP program
- ✓ No press anti-nuclear news, only some articles from Green-peace
- ✓ Villages close to the NPP asked for an Emergency Evacuation Plan and local hospital with capability to treat contaminated persons (no anti-nuclear movements)
- ✓ No a continuous anti-nuclear movement
- ✓ At present: no anti-nuclear news

- ✓ No questions to cancel new nuclear projects or stop current constructions
- ✓ National Government: no official “nuclear news” announcements on Nuclear Project Status
- ✓ Brazil and Argentina Agreement to work together in case of a “Radiological Emergency”



Implication of Fukushima on Argentina Nuclear Program **ALL NUCLEAR INSTALLATIONS**

- **Argentina National Regulator (Autoridad Regulatoria Nacional: ARN)**
 - Request to all relevant nuclear installations: “Comprehensive risk and safety assessments (the so called: Stress Tests)”
 - Stress Tests will evaluate how the nuclear facility would cope during earthquakes and other natural disasters nuclear plants would cope during:
 - earthquakes
 - other natural disasters
 - man made hazards





Implication of Fukushima on Argentina Nuclear Program NUCLEAR POWER PLANTS 1/4

After Fukushima Accident, independent evaluations were done by (aprox. 45 days):

- ✓ Operator (NA S.A.)
- ✓ Regulator (ARN)

After that, several meetings were held between Regulator and Operator, to clarify the scope of the evaluations required by the Regulator.

CNA1 & CNA2



CNE





Implication of Fukushima on Argentina Nuclear Program NUCLEAR POWER PLANTS 2/4

ARN and NA S.A. participated in several international meetings on lessons to be learned from the accident at Fukushima Daichii Nuclear Power Plant, such as:

- Convention on Nuclear Safety
- Ministerial Conference on Nuclear Safety
- “Foro Iberoamericano de Reguladores Radiológicos y Nucleares (FORO)” (Ibero-American Forum of Radiological and Nuclear Regulators), and
- CANDU Senior Regulators group

CNA1 & CNA2



CNE





Implication of Fukushima on Argentina Nuclear Program NUCLEAR POWER PLANTS 3/4

Later, ARN proposed to the “Foro Iberoamericano de Reguladores Radiológicos y Nucleares (FORO)” (Ibero-american Forum of Radiological and Nuclear Regulators) a “stress-test” to be required of its members (utilities of Argentina, Brazil, Spain and Mexico).

This “stress-test” is similar to the one required by:

- WENRA – Western European Nuclear Regulators Association
- ENSEG – European Nuclear Safety Regulatory Group, and
- Spain Regulator (Consejo de Seguridad Nuclear de España)



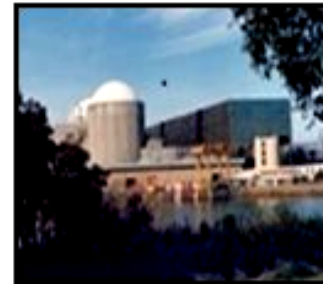
Foro Iberoamericano de Organismos
Reguladores Radiológicos y Nucleares



Atucha I y II
Argentina



Angra I y II
Brasil



Almaraz
España



Laguna Verde
México



Implication of Fukushima on Argentina Nuclear Program NUCLEAR POWER PLANTS 4/4

ARN requested NA S.A. to perform the “stress-test” on its Three Nuclear Power Plants. The results were submitted to ARN on:

- April 2012 for CNA1 and CNE
- May 2012 for CNA2
- A similar request was made to the Argentine Atomic Energy Commission for the CAREM NPP.

Final results, cross checking included, will be available before August 2012, to be presented at the 2012 extraordinary meeting of the Nuclear Safety Convention (IAEA Vienna) devoted to actions taken as a consequence of Fukushima (Sept, 2012).

Note: Spain is doing the stress-test required by WENRA and has accepted to do the FORO “stress-test”.

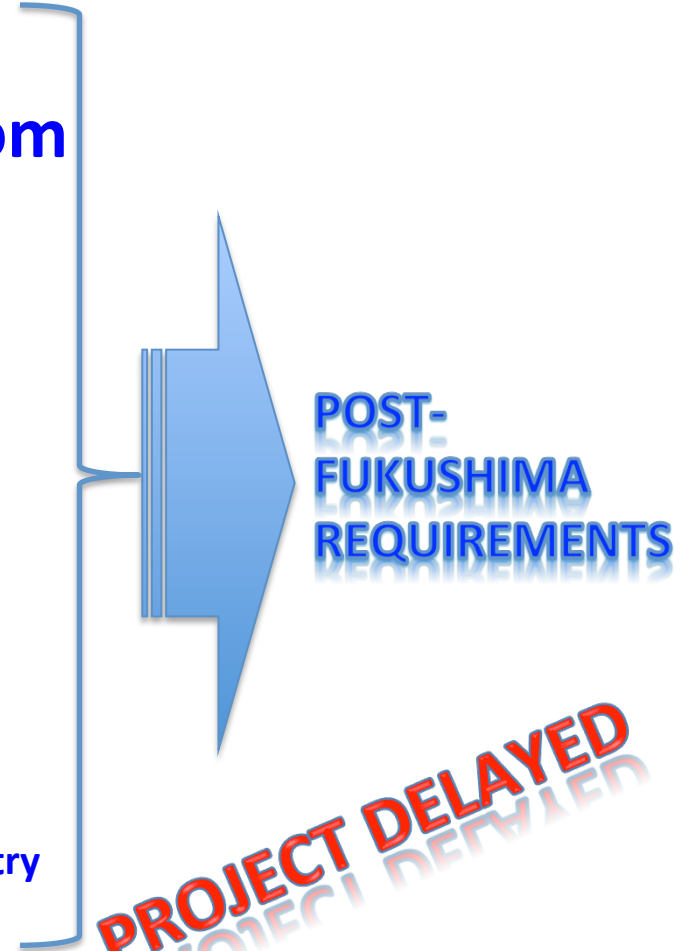


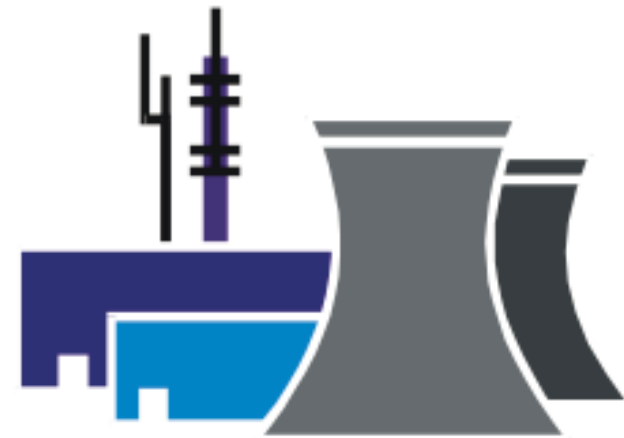
ARGENTINA NUCLEAR PROGRAM
Present Situation
(Nuclear National Law 26.566 – Year 2009)

Post-Fukushima

4TH ARGENTINA NPP PROJECT STATUS

- ✓ Siting selection (Atucha site?)
- ✓ Revised all designs → Feedback from Fukushima Accident
 - ✓ Siting selection
 - ✓ Spent Fuel Cooling
 - ✓ Emergency Water Makeup
 - ✓ Flooding and Seismic Margins
 - ✓ Station Black-out, etc.
- ✓ New prequalification of already prequalified NPP design (the nuclear industry has done changes on the ground in response to Fukushima)





WORDWIDE

GLOBAL ECONOMICAL CRISIS



FUKUSHIMA ACCIDENT



NUCLEAR PROJECTS DELAYED

*Economical crisis and
nuclear safety concerns*



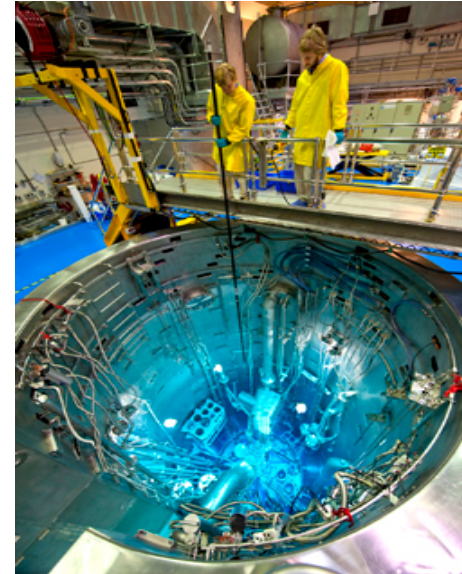
Implication of Fukushima on Argentina Nuclear Program RESEARCH REACTORS

INVAP

Pool type RRs → more strictly requirements for a safe shutdown under severe earth quake condition.

CNEA (RA-10 RR under construction). Subjects considered at its preliminary design phase:

- The capability of the design to limit and mitigate rare-beyond the design basis events taking into account site characteristics.
- The assessment of plant behavior during extended black out conditions.
- The identification of systems that could contribute to handle rare-beyond the design basis events.
- The assessment of the emergency planning focusing on events where barriers or levels of defense in depth could be degraded or breached.



Flooding?

Stress Test to Fukushima case scenario Hydroelectric Dam Tsunami in Argentina?



Itaipú Dam or Hydroelectric Power Station

The dam is 7,235 meters long, and its installed equipment has a maximum power output of 14,000 MW_e



Yacyretá Dam or Hydroelectric Power Station

The dam is 808 meters long, and its installed equipment has a maximum power output of 3,100 MW_e

Previous studies showed that in case of a total simultaneous failure of both Dams, the water coming from them would not reach the NPP (one month delayed!)



Thank you!