

NUCLEAR POWER PLANT CONTROL AND INSTRUMENTATION ACTIVITIES IN ARGENTINA DURING 1989-1991

J.R. LORENZETTI

Comisión Nacional de Energía Atómica,
Buenos Aires, Argentina

Abstract

A brief resume of the activities in the different areas of control and instrumentation is included.

As there was a delay in the construction of the new power plant most of the effort were dedicated to the plants that they are in operation.

It has been added instrumentation to have better information in the control room and to check new variables of the plant according with the experience learned from the operation.

It was dedicated special strength in the areas of training simulators and in service inspection.

1.- THE STATUS OF NUCLEAR POWER IN THE COUNTRY

In Argentina we have two plants in operation and one under construction.

Atucha I, now at full power, has had a long outage due to some breakages in the reactor internals.

Embalse Power Plant has been working mostly at 100% of its power these two years.

The plant under construction, Atucha II, has been delayed in its schedule because of some shortage in budget.

The fourth power plant, that according with the nuclear plan has to be now under construction, is postponed.

2.- THE ACTIVITIES OF NPPCI DURING THE LAST PERIOD

According with the actual status of the nuclear plants we dedicated our work specially to improve the operation of Embalse and to finish the outage of Atucha I that was out of service from August 1988 until December 1989.

Most of the effort in Embalse was directed to the analysis of the events that, coming from grid perturbations, could

end with outages or could perturbate the operation of the plant.

After some analysis the control algorithm implemented in the process computer has been modified.

As a result of those changes we increase the performance of the plant.

The reparation of Atucha I obliged us to develop and construct some special tools to repair the internals of the reactor inside the pressure vessel. We must indicate that the pressure vessel could not be opened and the tools had to be inserted through the fuel channels.

To be able to start the plant once again, new equipment needed to be added. The purpose of the new equipment is to detect fails in the reactor internals.

One of them is a system that detects some unexpected vibration in the reactor internals through the analysis of the neutronic noise. The equipment was ready when the reactor became critical and a data bank was created during the new commissioning of the plant. The data will be used during the operation.

Another system integrated to the plant is a computer dedicated to the on line estimation of the energy balance in the moderator in order to detect any change in the power transfer from primary to moderator which could indicate a breakage in the reactor internals.

Every time that the fuel is changed in a channel we measure the force necessary for that purpose. A graphic of force versus length is made for each channel and stored in a data bank. Changes in the force will indicate problems in the channel.

An upgrade of the process computer system is under fulfilment.

3.- NEW DEVELOPMENTS

The control room of Atucha I shows changes. There are personal computers with color tubes in which some variables are on display.

Mimics and special graphics help the operator with a clearer indication of the state of the plant.

At this moment the data communication between the process computer and the display system is slow and accepts only few variables. There is a project to increase the speed of the system and to allow more variables to be on display. The old typewriter has been replaced by new line printers operating on a personal computer system.

In Embalse we are replacing the fuel machine analog controller for a digital one, based on dedicated computer system. The new controller replaces the old system with a more elaborated algorithm that takes care of the different

upset conditions that could happen during the fuel machine operation. The change was based in the good operational experience of the process computer in Embalse as a control device.

4.- TRAINING SIMULATORS

We do not have in our country any full scope training simulator, but we have agreements to use simulators for training purposes.

A small basic principles simulator for Embalse Power Plant with a limited scope of malfunctions is under development. The simulation will operate in one personal computer based on 386 - 486 microprocessor. A couple of personal computer are included in the system, one will do the job of training console and the other will work as an operator console.

5.- IN SERVICE INSPECTION

In service inspection has been a fast growing branch in the past two years, starting from the equipment to verify the reactor vessel, it was latter used to test nozzles. We added an equipment to test the boiler tubes. We will locate and reposition the fuel channel spacers that separate the pressure tube from the calandria tube in Embalse using a special equipment acquired for that purpose.

Normally they are dedicated equipments with high degree of technology and we need to have a team for understand and maintain such equipments in operation as well as to be responsible for its comissioning.

6.- FUTURE TRENDS

The objective in the operation of the plant is to use a large amount of data which is available in a power plant and make it more useful for the operator. We are looking for a better presentation of the data and also to employ expert systems to elaborate the information. We expect to have in the future a control room with less crude and more elaborate data.

STATUS OF INSTRUMENTATION AND CONTROL ACTIVITIES IN AUSTRIA, 1990-1991 (Summary)

A. NEDELIK
Österreichisches Forschungszentrum Seibersdorf,
Seibersdorf, Austria

The general situation of nuclear power in Austria is still characterized by the country's decision against nuclear power generation.

This means that at present practically no significant I&C activities are carried out, which have direct relation to NPP applications.

Some research and development in related areas is done at the Technical University of Graz:

- 1.) Processing techniques of fission chamber signals (non-linear signal processing, third order AC signal moments ...)
- 2.) On-line monitoring of radioactive aerosols in air
- 3.) Fault detection in digital circuits for safety applications (signature register method, design of fault tolerant systems using the error detection capability of real number codes ...)

The decommissioned NPP at Zwentendorf is still being "sold out", i.e. various components, especially heavy mechanical equipment are sold in order to reduce the financial losses to some extent.

Future plans are still concentrating on the construction of a gas turbine power plant at the site.