

**TACIS Project: U1.01/97B, Handling of hydrogen in the containment during normal operation and in accidents in RNPP units 1 and 2**

**Project description**

This project implemented in the frame of the European Commission TACIS Nuclear Safety Programme deals with the hydrogen hazard issue which is one of the important aspects of NPP safety.

The objective of the project is to install the hydrogen recombination equipment in the containment rooms with view to prevent potential hydrogen deflagration or detonation in both NPP normal operation and accident conditions.

This contract includes design, safety analysis, manufacturing, factory acceptance test and delivery of the 18 passive autocatalytic recombiners (P.A.R.), an on-site testing equipment, spare parts for 5 years, a tool kit, documentation in English and Russian as well as provision of installation and licensing support, acceptance and commissioning tests, equipment certification/qualification and training.

**Contract amount : 550 k Euro**



**Organisations involved**

Funding and logistic support: EC

Beneficiary: NAEK ENERGOATOM

End User: ROVNO NPP

Procurement Agent: ITALTREND/GOPA

Supplier: FRAMATOME ANP GmbH

Integration studies: KIEP

Installation and testing: ROVNO NPP

On Site Assistance: EDF (EC

Consultant)

**Time Schedule**

1996 - 1998 Basic design studies related to the selection of hydrogen mitigation techniques for the containment

1999-2000 Elaboration & approval of the Technical Specification for supply

February 2001 Tender Launch

May 2002 Signature of the supply contract

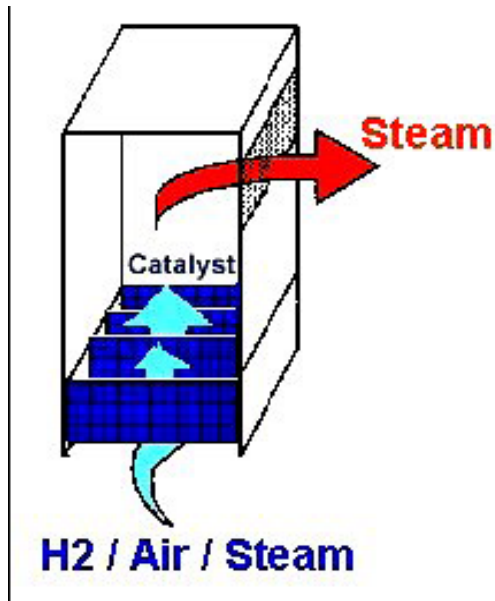
2002-2003 Elaboration of the Justificatory documentation for licensing

2003 Manufacturing & Factory Acceptance Tests

29 July - 4 August 2003 9 P.A.R. were installed and commissioned in the RNPP Unit 2

21 April - 2 May 2004 9 P.A.R. were installed and commissioned in the RNPP Unit 1

### Operation of P.A.R system



Gas mixtures containing hydrogen are recombined upon contact with the catalyst in the lower part of the housing.

The heat from catalytic reaction in the lower part of the P.A.R. results in natural convection supplying the catalyst with a large amount of gases containing hydrogen that ensures high efficiency of recombination.

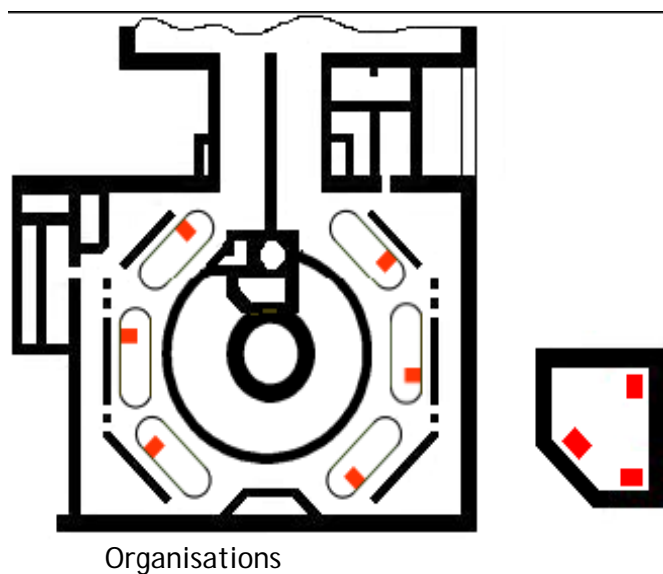
The hot exhaust (steam) is turned to the free volume of the compartment by lateral gas outlet of the P.A.R. housing.

P.A.R operates without external energy supply or human action.

### Main Benefits of the project

- Installation of the P.A.R. system which will avoid any hydrogen combustion mode that could cause containment failure in Design Basis Accident conditions
- Information exchanges about hydrogen risk and Western hydrogen mitigation techniques between the Parties involved in the Project, particularly within the "2+2" approach

### Safety improvement



- This project was developed in accordance with the Safety Improvement Programme for ROVNO 1&2 with the VVER-440/213 Reactor Plants
- The P.A.R. system prevents occurrence of any flammable concentration of hydrogen in the containment in both NPP normal operation and accident conditions
- During the project implementation, the "2+2" approach was applied, involving the Western and Ukrainian Regulatory Bodies with their respective Technical Support

PAR location in SG box and in pressurizer room of RNPP units 1 and 2.