

## **APPENDIX A: ASSIGNMENT OF RESEARCHERS FROM PARTICIPATING INSTITUTES TO THE PROTEUS TEAM**

### **1. China [Institute for Nuclear Energy Technology (INET), Beijing]**

- (a) Prof. Luo (INET) was assigned to the PROTEUS team for 3 months in 1990 to formulate the Chinese participation especially with regard to the physics data needed to confirm the design of the 10 MW Test Module planned to be constructed at INET.
- (b) Dr. Shan (INET) arrived in September 1990 for an assignment of 1 year. Dr. Shan conducted the following tasks:
  - criticality safety calculations for the new HTR fuel storage container at PROTEUS.
  - calculations of the worth of the ZEBRA type fine control rods for the pebble fueled cores.
  - LEU-HTR PROTEUS CRP benchmark calculations.
- (c) From July 1992 through March 1993 an experimentalist, Dr. Xu Xiaolin from INET, was assigned to Paul Scherrer Institute to help carry out flux distribution measurements and to plan other experiments of interest to the Chinese HTR program such as investigations of the use of N<sub>2</sub> gas injection and/or a layer of burnable poison pebbles on top of the core as reserve shutdown mechanisms.
- (d) Dr. Zhong completed a 6 month assignment in August 1994. Dr. Zhong helped with the analysis of reaction rate measurements and planning of experiments of interest to China.

### **2) Germany (KFA Forschungszentrum Juelich)**

- (a) Germany had planned to delegate a researcher to the PROTEUS facility. However, due to the scaling down of the German HTR program, this did not occur. Contact was maintained between the PROTEUS team and researchers at KFA performing related analytical activities for the PROTEUS benchmark calculations experiments.

### **3) Japan (JAERI)**

- (a) Mr. Yamane from the Japanese VHTRC critical experiment facility was assigned for 1 year to the PROTEUS project beginning in March 1991. Mr. Yamane's contributions included participation in the implementation of pulsed neutron subcriticality measurement techniques at PROTEUS and in experiment planning based on his experience at the VHTRC. Mr. Yamane returned to PROTEUS for one week in February 1993 and for a further week in March 1995 to discuss progress in experimental technique development.
- (b) Mr. Fujisaki, Chief of the VHTRC Operating Group, was assigned by JAERI to the PROTEUS team for 3 months beginning in August 1992. His tasks involved assistance in planning experimental measurements (rod worth and calibration,

reaction rates, and kinetic parameters), as well as making a comparison of operational procedures and experience at the VHTRC and PROTEUS facilities.

#### **4) USA (Oak Ridge National Laboratory)**

- (a) Mr. L. Jordan from the Oak Ridge National Laboratory (ORNL) was assigned to PSI in 1991 for 2 months. Mr. Jordan prepared a draft Quality Assurance Program for the experiments. The QA Plan and Procedures was accepted (revision O) by PSI.
- (b) Dr. Difilippo from ORNL was assigned to PSI from May through October 1991, and for two weeks in July 1993. His tasks involved planning of reactivity measurements using inverse kinetics and pulsed neutron techniques.
- (c) Mr. G. Smolen was assigned to the PROTEUS team in June 1992 for 13 months. His tasks included analytical activities, development and documentation of experiment plans, measurement procedures, and assistance in implementation of the Quality Assurance Programme. A draft Revision 1 of the QA Plan and Procedures was prepared by Mr. Smolen. Mr. Smolen also worked on a description of the PROTEUS-HTR facility.
- (d) Mr. L. Jordan returned to PSI in July 1993 to revise the PROTEUS QA plan and Procedures to more accurately reflect actual practice at PROTEUS and the needs of the US DOE MHTGR Programme.

#### **5) The Russian Federation (Kurchatov Institute, Moscow)**

- (a) Dr. Paramonov and Dr. Tsibulski (Kurchatov Institute, Moscow) visited the PROTEUS project for one week in July 1991 for technical discussions of relevant experience gained at the ASTRA and GROG critical experiment facilities at Kurchatov. Also, plans were made for extended assignment of Russian researchers to the PROTEUS project.
- (b) Dr. Paramonov (Kurchatov Institute) and Dr. Sukharev (Experimental Machine Building Design Bureau (OKBM, Nizhni Novgorod) were assigned to the PROTEUS experiment during May and June 1992 for detailed discussions of experimental measurement techniques, including measurement of local reaction rates in fuel elements.
- (c) Dr. Tsibulki, Dr. Sukharev and Dr. Paramonov were assigned to PROTEUS during autumn, 1992.
- (d) Mr. Subbotin (Kurchatov Institute) arrived in early April 1993 and stayed until October 1993. Mr. Subbotin was also assigned for about one week in late 1992.
- (e) Dr. Paramonov was assigned to PSI from February 1993 through May 1993 and performed reaction rate measurements.

- (f) Dr. Smirnov (Kurchatov Institute) was assigned from late October through early December 1993 to measure the reactivity effects of small absorbing samples.
- (g) Dr. Lebedev (Kurchatov Institute) began a 3 month assignment in February 1994 to conduct noise measurements for determination of reactor power with the use of He<sup>3</sup> neutron detectors.
- (h) Dr. Subbotin returned during summer 1994 for preparatory work concerning reaction rate measurements using Russian pebbles/foils.
- (i) Dr. Davidenko visited PROTEUS for a three month period beginning in February 1995. He worked on the PROTEUS system description document and on the comparison of Russian calculations with measured reactivity effects in cores 1 and 5. Dr. Subbotin returned in March 1995 to take part in the measurement of reaction-rates used Russian particles and foils.

**6) France (Centre d'Etudes Nucleaires de Cadarache)**

- (a) Dr. J.P. Chauvin (CEA, Center d'Etudes de Cadarache) worked at PROTEUS for a month during Autumn 1993. His activity involved reaction rate measurements, and assessing and reducing measurement uncertainties in experimental techniques.

**7) The Netherlands (Delft University and ECN Petten)**

- (a) E. Turkcan (Petten) visited for 2 days in late 1993 to demonstrate reactivity measurement techniques.
- (b) Beginning in June 1994, E. Wallerbos was assigned to the PROTEUS team for a period of 15 months to perform reactivity measurements using noise analysis techniques developed at ECN, Petten, the Netherlands. Analytical support for this work was also conducted at ECN and at Delft University.
- (c) Various short visits were made to PROTEUS by scientists from ECN and Delft to discuss the calculation of the PROTEUS benchmark.