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EUROPEAN COMMISSION
5th EURATOM FRAMEWORK PROGRAMME 1998-2002
KEY ACTION : NUCLEAR FISSION

HTR-E

High-Temperature Reactor Components and Systems

CONTRACT N°
FIKI-CT-2001-00177

Work Plan

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Deliverable D 43

Modifications

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- (1) European contract n° FIKI-CT-2001-00177



1. OBJECTIVE OF THE WORK PACKAGE

The objective of WP 6 of HTR-E is to specify the content of helium impurities of direct cycle HTRs and to identify input data for a Helium Purification System design. From the impurity control result two aspects

- ◆ Radiological releases in normal and accidental conditions (tritium, radioactive noble gases)
- ◆ Corrosion of materials (graphite and metallic high temperature alloys)

The activities focus the following aspects:

- ◆ Documentation and analysis of available know-how from former HTR projects.
- ◆ Identification of input data for the system design



2. DESCRIPTION OF THE TASKS

The contractual objective of the Work Package is to produce three documents, which are identified D43 (work plan report), D44 and D45.

1.1 Deliverable D44

The title of the document is "Analysis of the helium environments in former HTRs"

The objective of the document is to establish through feed-back experience from several HTRs, the effect on materials of different Helium environments with regard to their optimised potential or deficit.

It concerns the following reactors:

- ◆ Dragon project (UK)
- ◆ THTR 300 (Germany)
- ◆ AVR
- ◆ HTTR, HTR 10
- ◆ HTR Modul

Information will be provided on helium atmosphere (gas contents, dust particles) during operation, initial specifications and helium purification system.

The data for the HTR Modul, a licensed concept, are based on experimental data of the KVK test facility.

The Fort-St Vrain reactor is not retained in this list because its environment is not representative due to water content in the primary circuit.

The HHV test loop is not retained because its environment is not representative due an oil ingress into the loop.

The organisation of the document can be found in table 1. Two draft versions of this document will be issued.

1.2 Deliverable D45

The title of the document is "Specifications and recommendations for the Helium impurities contents."

The spectrum of input data on the impurities, purification degrees, operational and accidental conditions will be derived from former HTR and actual direct cycle HTR concepts. The specifications for the helium impurities contents and recommendations for the purification system will be provided for a modern HTR with direct cycle (GT-MHR and PBMR reactor).

The possible range of impurities in Helium (H_2O , H_2 , CO_2 , CO , CH_4) and graphite particles has to be defined taking into account the risk of corrosion, erosion of the materials. Additionally the



thermodynamic equilibrium in helium environment is analysed in order to assess the impact on the materials (corrosion,...).

These data will be useful to the selection of grades for high temperature materials tests in HTR-M and also to the tribological tests in Helium environment WP5 HTR-E.

The organisation of the document can be found in table 2. Two draft versions of this document will be issued.



3. DEFINITION OF THE TASKS OF EACH PARTNER

The partners involved in the Work Package are :

Framatome ANP France (1),

NNC (7),

FANP GmbH (15),

FZJ (5),

The proposal of the repartition of the budget by document and partner is the following :

	D43	D44	D45	Total	Proposal rev2
FRA (1)	0.0	2.0	1.9	3.9	
FZJ (5)	1.0	1.9	1.0	3.9	
NNC (7)	0.0	2.4	0.0	2.4	
FANP GmbH (15)	0.0	1.0	1.0	2.0	
Total	1.0	7.3	4.9	13.2	

Remarks :

The numbers in the columns are man months.

The volume reserved for each partner are the same as those in the proposal.



4. IDENTIFICATION OF THE INTERFACES WITH THE OTHER WORK PACKAGES

There are not input deliverables coming from the other workpackages. Nevertheless could a specification of the helium inventory and the helium leakage be better than an own estimate. The outputs from WP6 (deliverables) will be used as input data for WP5 “Tribology in Helium environment” of HTR-E and for HTR-M and M1 projects.



5. FUTURE MEETINGS

The next meeting will be held during the fourth quarter of 2002. The precise date and location of the meeting will be proposed by the WP6 leader in accordance with the WP5 meeting.



Table 1
Deliverable 44

DELIVERABLE 44

Title "Analysis of the Helium environments in former HTRs"

Schedule January 2002 – July 2002 postponed to January 2002 – December 2002

Responsible FZJ (5)

Partners FRA-ANP (1), NNC (7), FANP GmbH (15)

DOCUMENT ORGANISATION

INDEX	RESPONSIBLE	INPUT NEEDED	DATE
- General principles Feed-back experience from former HTRs and test facilities, giving information on: - Fresh Helium specifications - Helium specifications in operation - Purification system design philosophy - Helium atmosphere in reactors			
Dragon project,	NNC (7) with FRA-ANP (1) contribution		Draft available in August 2002
THTR 300, AVR,	FZJ (5)		Draft available in August 2002
HTTR, HTR10,	FRA-ANP (1)	From HTTR and HTR10 (HTR TN agreements)	Draft available in August 2002
HTR Modul (licensed concept)	FANP GmbH (15)		Draft available in August 2002
Conclusion: synthesis of documents	FZJ (1)		<u>Draft</u> : Oct 2002 for partner comments <u>Final</u> : Dec 2002



Table 2
Deliverable 45

DELIVERABLE D45

Title "Specifications and recommendations for the Helium impurities contents"

Schedule September 2002 –November 2003

Responsible FZJ (5)

Partners FRA-ANP (1), FANP GmbH (15)

DOCUMENT ORGANISATION

INDEX	RESPONSIBLE	INPUT NEEDED	DATE
- General principles - Specifications for PBMR type - Specifications for GT-MHR type - Recommendations for impurities contents			
GT-MHR type	FRA-ANP (1)		Document available in June 2003
PBMR type	FZJ (5)		Document available in June 2003
Recommendations for HPS pre-design (plant operation, safety,...)	FANP GmbH (15)		Document available in August 2003
Recommendations with regard to the material aspect (thermodynamic equilibrium analysis)	FRA-ANP (1)		Document available in June 2003
Conclusion: synthesis of documents	FZJ(5)		<u>Draft</u> : Oct 2003 for partner comments <u>Final</u> : Dec 2003



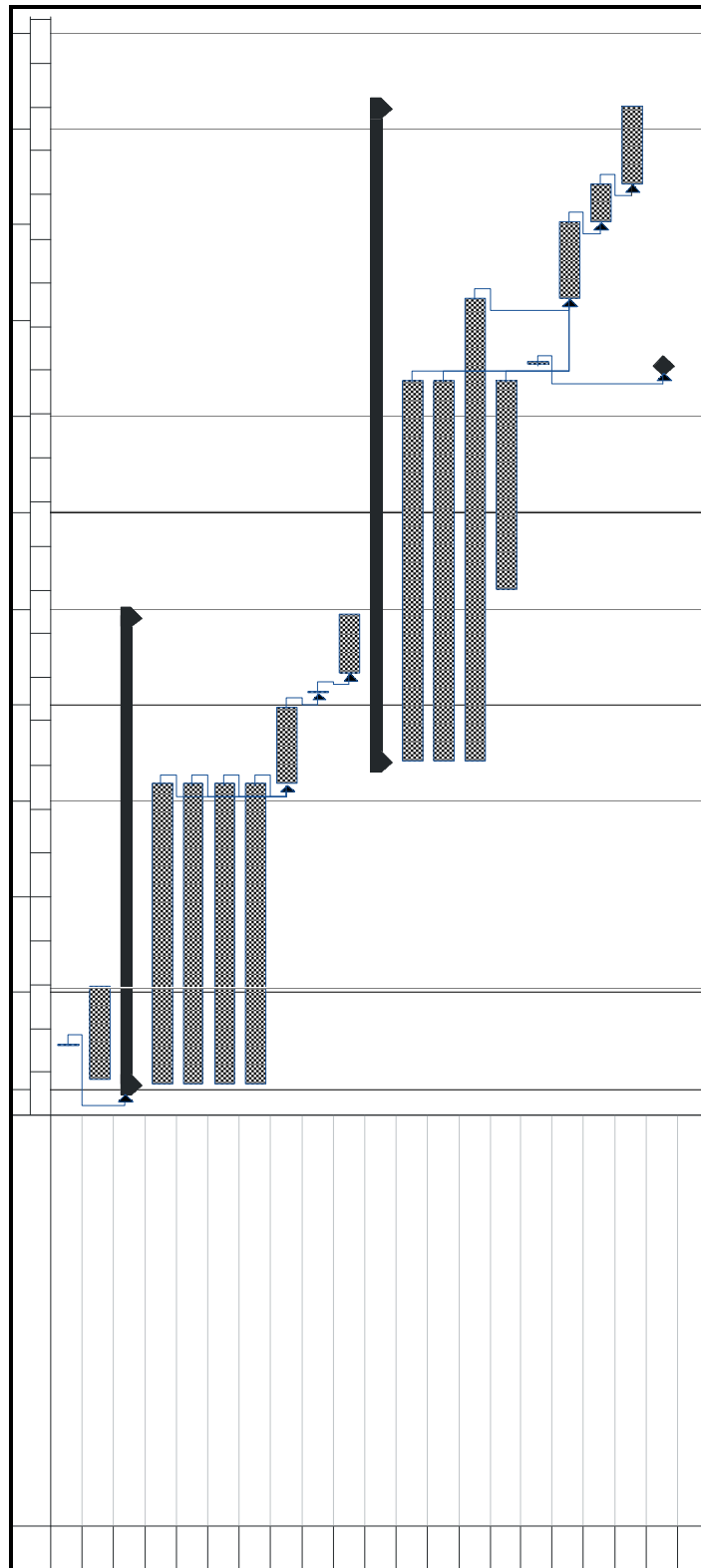
Table 3
Manpower per year

	Year one	Year two	Total
FRA (1)	2.0	1.9	3.9
FZJ (5)	1.9	2.0	3.9
NNC (7)	2.4	0.0	2.4
FANP GmbH (15)	1.0	1.0	2.0
Total	7.3	4.9	12.2

The numbers are in man months.



Table 4
 Schedule



Time schedule with delivery date of the draft and final documents