



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

HTR-M

**European Project for the development of HTR Technology -
Materials for the HTR**

CONTRACT N°
FIKI-CT-2000-00032

Technological Implementation Plan

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Project Coordinator

NNC Ltd.

UK

Dissemination level : CO
Document Number: HTR-M-01/3-D-0-0-3

TECHNOLOGICAL IMPLEMENTATION PLAN

*A Framework for the further development, dissemination and use of
the results of EC RTD Projects (including also thematic networks and concerted actions)*

DATA SHEETS



X Final version before final term (contractual obligation)

Part 1: Overview and description of your project and its results*One form per project***Publishable**

1.1: Executive summary (to be used for an accurate update of the programme synopsis of projects)

1.2: Overview of all results

1.3: Quantified data on the project

1.4.: Assessment of the European interests : This section enables the co-ordinator to explain the interest for the European Union (the competitiveness of its industries, the usefulness for (part of) its population,...) of the achieved results and of their foreseen impacts.

1.5.: Expected project impact

Part 2: Description of each Result - Search for collaboration through Commission services*One form per Result***Publishable**

This section will be used to document your result(s) in CORDIS and to inform any appropriate audience

2.1 : Description of the result(s)

2.2 : Quantified data about the result

2.3 : Further collaboration, dissemination and use of the result : This section enables each partner – individually or as a consortium – to describe its needs in further collaboration in view of the dissemination and use of its results(s).

Part 3: Description of the intentions by each partner*One form per partner***Confidential**

This section enables each partner – individually or as a consortium – to describe its use and dissemination intentions (including a timetable of its future activities).

3.1 : Description of the use and the dissemination of result(s), partner per partner

3.2 : Quantified data for each partner's main result

- ❑ The Technological Implementation Plan data sheets are available as a predefined form in Microsoft Word format. The file may be downloaded from the European Commission's CORDIS web site at: <http://www.cordis.lu/fp5/tip.htm> or may be obtained by e-mail from your EC programme help desk or your Project Officer.
- ❑ The form should be completed electronically and returned preferably by e-mail to your project officer (Firstname.Lastname@cec.eu.int). Alternatively it can be sent on a diskette to the address provided by your Project Officer :
 - ✓ Part 1, 2 by the project co-ordinator;
 - ✓ Part 3 by the project co-ordinator or by each partner individually, as preferred.

Part 1 Overview and description of your project and its results

EC PROGRAMME :	5th EURATOM RTD Framework Programme
PROJECT TITLE & ACRONYM:	European Project for the Development of HTR Technology - Materials for HTR - (HTR-M)
CONTRACT NUMBER :	FIKI-CT2000-00032
PROJECT WEB SITE (if any) :	SINTER - Forum HTR-M & HTR-M/M1
PARTNERS NAMES :	NNC Ltd Framatome ANP. Commissariat a Energie Atomic (CEA) European Directorate General Joint Research Centre (JRC-IE) Nuclear Research and Consultancy Group (NRG) Forschungszentrum Juuelich GmbH (FZJ) Framatome ANP (GmbH) Empresario Agrupados Internacional s.a. (EA)

1.1 Executive summary

Please, synthesise (in 1 or 2 pages) your project original objectives and final outcome.

a) Original research objectives

1. To develop materials and data for the reactor pressure vessel in the areas of design analysis, structural integrity analysis and materials properties under HTR conditions including testing on welds under irradiated and non-irradiated conditions.
2. To investigate materials for the high temperature regions of the HTR under simulated environments for the specific areas of the reactor internals (control rod) and turbine (blades & disc) including short and medium term tests.
3. To perform work to establish graphite materials information for future prioritising of work and carry out testing on graphite oxidation under consequences of severe air ingress with core burning and advanced C-based options.

b) Expected deliverables

1. Reports on vessel materials covering a technological survey and data-base plus new weld test results under irradiated and non irradiated conditions for chosen steel vessel material.
2. Reports on high temperature materials for internals (control rod) and turbine (blades & rotor) covering technological review and data base plus new test results for chosen alloy steel materials including tests in simulated helium environments.
3. Reports on graphite materials including technological review and data-base, graphite selection and test results for effects of oxidation associated with severe air ingress on graphites and C-composite materials.

c) Project's actual outcome (in terms of technical achievements or if appropriate task per task)

TO BE COMPLETED AT THE END OF PROJECT.

All required technical Deliverables were achieved:

1. **Vessel:** The technological review and data base work identified the available information and data to be incorporated and confirmed the choice of Mod 9Cr 1 Mo steel as the material to use in the irradiation test programme. Properties for inclusion in the database were assembled to provide a platform of materials information for technological development. A suitable number of simulated pressure welds were fabricated and small section test pieces machined and incorporated into a test rig in the High Flux Reactor for testing. Mechanical tests were performed on irradiated and non-irradiated specimens and the results confirmed that the levels of irradiation to be experienced by the HTR reactor Pressure Vessel were small compared with batch-to-batch variations. The assessment showed that the RCC-MR weld factor $J_r = 0.9$ for Mod 9Cr 1 Mo steel weldments was applicable to these RPV weld tests.

2. **High Temperature Materials:** The review work enabled a short list of materials and available properties to be assembled together with published information on experiences on manufacture and effects of environment. Irradiated properties will ultimately be required for C/C composite materials. Most published information on C/C composite materials comes from Fusion applications and a wider dissemination to and from this area should prove beneficial. The short term tests on the turbine materials in air and representative corroded conditions are aimed at providing bounding information for assessment of creep strength under HTR conditions. The tests in air confirmed that the selected materials properties were consistent with published data. The best available disc material (Udimet 720) was considered to be acceptable up to 700°C, which confirms the need for cooling. The better blade material in terms of strength and life appears to be CM 247 LC DS however this still has to be verified by the corrosion and medium term creep tests of HTR-M1.

3. **Graphite:** The technological review confirmed that most graphites that have been used in previous core designs are no longer manufactured commercially, and currently available grades are limited to a few specific sources of raw materials. Cooperation with graphite manufacturers began at the outset to encourage open exchange of information on all issues affecting material availability and behaviour. Although the current project falls short of the ultimate selection criteria for the graphite, which will mainly be based on long-term irradiation behaviour, it does provide the groundwork for continuation of the HTR-M1 irradiation programme on the most desirable graphite(s). The experimental work on graphite involves oxidation tests in the THERA and INDEX facilities at temperatures between 550 and 750°C and partial pressures of between 2 and 20kPa in air and between 900– 980 °C at $P[H_2O] = 1$ in steam. This includes oxidation resistance of three-selected Carbon-Fibre-Composites (CFC's) plus experiments to determine the thermal conductivity of CFC materials in irradiated and non-irradiated samples. Results were used to advance the understanding and evaluation of graphite and C- composite material oxidation and behaviour.

d) Broad dissemination and use intentions for the expected outputs (such as industrial development, standards, regulations and norms, improvement of environment, health, working conditions, employment, net economic benefits, etc)

The partners will exploit the results of this study in the development of a European based HTR & VHTR addressing feasibility issues connected with material options for the vessel, high temperature metal structures and graphite structures, maintaining a level for recording and retaining experience within Europe. The work provides a firm materials platform on which to deliver an improved basis for the selection of materials for the High Temperature Reactor system and its major components. Dissemination of results within Europe are made through other HTR collaborative 5th Framework Programme projects and through the Technical Network HTR-TN. With regard to a wider International collaboration this is done via the Generation IV International Forum (for which the EU is a member country) and specific links with Russian developments (via ISTC) plus exchanges with Japan (HTRR), US (NGNP) and China (HTR-10). Overall it is considered that the results from the HTR-M project provide an important contribution to HTR & VHTR materials advancement in Europe and within the International Community through the Generation IV International Forum.

1.2 Overview of all your main project results

No.	Self-descriptive title of the result	Category A, B or C*	Partner(s) owning the result(s) (referring in particular to specific patents, copyrights, etc.) & involved in their further use
1	Review of vessel materials & establishing data base for HTR	B	All Partners
2	Vessel material test results under irradiated and non irradiated conditions	B	All Partners
3	Summary Report of vessel material investigations for HTR.	B	All Partners
4	Review & establishing data base for materials for the high temperature structures (internals & turbine) of HTR.	B	All Partners
5	Investigations and testing of materials for the high temperature structures (control rod & turbine (blades & disc))of HTR.	B	All Partners
6	Summary Report of high temperature material investigations for HTR	B	All Partners
7	Review of graphite materials & data base / selection for HTR	B	All Partners
8	Graphite test results for effects of oxidation associated with severe air ingress	B	All Partners
9	Summary Report of graphite material investigations for HTR	B	All Partners
10	Overall Technical Report	B	All Partners

* A: results usable outside the consortium / B: results usable within the consortium / C: non usable results

1.3	Quantified Data on the dissemination and use of the project results
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Items about the dissemination and use of the project results (consolidated numbers)	Currently achieved quantity	Estimated future* quantity
# of product innovations (commercial)		
# of process innovations (commercial)	1	
# of new services (commercial)		
# of new services (public)		
# of new methods (academic)		
# of scientific breakthrough		
# of technical standards to which this project has contributed	2	
# of EU regulations/directives to which this project has contributed		
# of international regulations to which this project has contributed	1	
# of PhDs generated by the project	0	
# of grantees/trainees including trans-national exchange of personnel		

= number of ... / * “Future” means expectations within the next 3 years following the end of the project

1.4. Comment on European Interest

All projects are expected to meet European interests. This section should provide an appraisal of your project in terms of European added value and support to the implementation of European Union policies.

1.4.1. Community added value and contribution to EU policies

a. European dimension of the problem

(The extent to which the project has contributed to solve problems at European level)

Development of sustainable energy systems is a challenge of both European and global dimension. Sustainable energy supply for Europe addresses the issues of safety, resource protection, waste reduction, waste disposal, proliferations resistance and economics. The HTR-M project deals with all of these aspects by investigating materials which are going to be used in future plant.

The large participation of European nuclear industry in international projects, in the European Project of Development of HTR Technology and in HTR-TN shows that there is an increasing interest of the European nuclear industry for the industrial development of the HTR type of reactor. This interest is for both the European and the export market.

The work is carried out in collaboration with European partners to take benefit from their expertise.

b. Contribution to developing S&T co-operation at international level. European added value

(Development of critical mass in human and financial terms; combination of complementary expertise and resources available Europe-wide)

In the past, HTR development in Europe has been performed on an international level and reached a leading role, worldwide. The OECD-funded DRAGON reactor project in UK, being the very first HTR, included most EURATOM members as well as non-European countries (US, Japan). The 300 MWe demonstration reactor THTR also had the status of a European project.

However, most European R&D activities in the HTR field were reduced in the 1990s although international interest in this technology still persisted which lead to the construction of two new HTR test reactors (HTTR, HTR 10) and two commercial projects (PBMR, GT-MHR).

The European HTR-Technology Network (HTR-TN) has been established to recover the European know-how from the past and to advance the HTR-related key technologies. This complementary European collaboration has created a critical mass in human and financial terms that is internationally acknowledged.

c. Contribution to policy design or implementation

(Contribution to one or more EU policies; RTD connected with standardisation and regulation at Community and/or national levels)

The Specific Programme on Energy, Environment and Sustainable Development (EESD) focuses directly on a sustainable development perspective, which addresses objectives such as use of natural resources and ecosystems, threats of global climate change, quality of life, and the impact of the production and use of the energy which is essential to European economies, standard of living and environmental issues.

Making use of the knowledge and technologies developed by the HTR development programme will make it possible to contribute to a wide range of social and economic needs so reconciling economic development with environmental sustainability. The results will support policies formulated at Community level or deriving from international commitments by including advanced nuclear energy into the energy supply options. In addition, HTR can supply process heat for highly effective decentralised combined heat and power (CHP) and for hydrogen generation.

1.4.2. Contribution to Community social objectives

a. Improving the quality of life in the Community :

Environmentally benign, safe, secure and economic energy supply is a precondition for quality of life in the Community. CO₂-free, low cost electricity from nuclear power plants allows more capacity of regenerative energy within the European energy mix by compensating their still more expensive electricity generating cost. This strategy should be continued in future by construction of innovative and advanced nuclear stations. Thus, CO₂-free nuclear energy will keep affordable for the European population and enhance quality of life. Modular HTR are designed in a way that radioactive fission products can be kept within the fuel elements even under extreme accident scenarios. They have a very clean primary circuit with very low radiological impact on the plant personnel and the environment. HTR can also provide combined heat and power for heating or process use. Long-lived waste can be burned in HTR without multiple reprocessing. HTR fuel is also very resistant for long-term final disposal.

b. Provision of appropriate incentives for monitoring and creating jobs in the Community (including use and development of skills) :

As for regenerative energy systems (e.g. water, wind, solar, biomass), advanced nuclear energy which complies to the criteria of sustainability and of public acceptance will face a considerable market in the future if the CO₂-free energy share in Europe does not imply economic burdens endangering competitiveness of European economy. A 'coalition' of regenerative energy and advanced nuclear energy leading to reasonable cost within the energy mix will therefore contribute to keep jobs in energy intensive manufacturing processes and to create more jobs in the field of CO₂-free energy system construction and application, both for regenerative and nuclear energy.

The present European HTR RTD programme helps to preserve existing know-how and to transfer it to a new generation of engineers and scientists. This paves the way for a broader industrial deployment of HTR in Europe and for participation of European experts in international programmes.

c. Supporting sustainable development, preserving and/or enhancing the environment (including use/conservation of resources) :

Enhanced safety standards - as typical for modular HTR - directly contribute to the preservation of the environment in case of severe accidents. High burn-up, good neutron economy and high thermal efficacy are effective measures to make better use of nuclear fuel resources, both natural uranium, thorium and reprocessed actinides. Combined Heat and Power generation additionally reduces waste heat discharges. Large scale hydrogen production by HTR heat will also contribute to the introduction of an hydrogen-based energy system. Currently, there is a general public perception that the wastes generated, decommissioning activities and the liabilities involved, are one of the major weak links of the nuclear industry. A successful waste management solution to HTRs will help to sustain a viable nuclear programme in the decades to come. In turn, this will maintain fuel diversity and promote nuclear power that is currently the predominant practical way of limiting greenhouse gas emission.

1.5. Expected project impact (to be filled in by the project coordinator)

Remark: by replying to the following questions, the coordinator is asked to express his best estimation regarding the impact of the project.

Overall Policy Impact¹

EU Policy Goals		I		II	
		SCALE OF EXPECTED IMPACT OVER THE NEXT 10 YEARS ²		other	
		-1 0 1 2 3		Not applicable to project	Project Impact too difficult to estimate
1. Improved sustainable economic development and growth, competitiveness Θ			2		
2. Improved employment Θ			2		
3. Improved quality of life and health and safety Θ			3		
4. Improved education Θ			2		
5. Improved preservation and enhancement of the environment Θ			3		
6. Improved scientific and technological quality Θ			3		
7. Regulatory and legislative environment Θ			3		
8. Other _____ Θ					

¹ Coordinator should respond to section I or, if appropriate, to section II. If the project has had no impact, a "0" should be entered in section I. Scores other than zero in section I will prompt a more detailed subquestion on a separate screen. However, you may access in any case the subquestions by clicking on the symbol" Θ "following each main question.

² Indication for scale as follows: -1 represents negative impact, 0 no impact, 1 small positive impact, 2 medium positive impact , 3 is a strong positive impact

Indicate your replies below by putting in each box the number corresponding to the score you chose:

1. Economic development and growth, competitiveness	Scale of Expected Impacts over the next 10 years (2)	
	By Project End -1 0 1 2 3	After Project End -1 0 1 2 3
a) Increased Turnover for project participants - national markets - international markets	0	2
b) Increased Productivity for project participants	1	2
c) Reduced costs for project participants	0	1
d) Improved output quality/high technology	0	1
e)		

2. Employment	Scale of Expected Impacts over the next 10 years (2)	
	By Project End -1 0 1 2 3	After Project End -1 0 1 2 3
a) Safeguarding of jobs	2	3
b) Net employment growth in projects participants staff	0	3
c) Net employment growth in customer and supply chains	0	3
d) Net employment growth in the European economy at large	0	2

3. Quality of Life and health and safety	Scale of Expected Impacts over the next 10 years (2)	
	By Project End -1 0 1 2 3	After Project End -1 0 1 2 3
a) Improved health care	0	1
b) Improved food, nutrition	0	0
c) Improved safety (incl. consumers and workers safety)	0	3
d) Improved quality of life for the elderly and disabled	0	1
e) Improved life expectancy	0	1
f) Improved working conditions	0	2
g) Improved child care	0	2
h) Improved mobility of persons	0	2

4. Improved education	Scale of Expected Impacts over the next 10 years (2)	
	By Project End -1 0 1 2 3	After Project End -1 0 1 2 3
a) Improved learning processes including lifelong learning	1	1
b) Development of new university curricula	1	3

5. Preservation and enhancement of the environment	Scale of Expected Impacts over the next 10 years (2)	
	By Project End -1 0 1 2 3	After Project End -1 0 1 2 3
a) Improved prevention of emissions	0	3
b) Improved treatment of emissions	0	2
c) Improved preservation of natural resources and cultural heritage	0	2
d) Reduced energy consumption	0	3

6. S&T quality		Scale of Expected Impacts over the next 10 years (2)	
		By Project End -1 0 1 2 3	After Project End -1 0 1 2 3
a)	Production of new knowledge	2	3
b)	Safeguarding or development of expertise in a research area	2	2
c)	Acceleration of RTD, transfer or uptake	2	3
d)	Enhance skills of RTD staff	2	3
e)	Transfer expertise/know-how/technology	2	3
f)	Improved access to knowledge-based networks	2	3
g)	Identifying appropriate partners and expertise	2	3
h)	Develop international S&T co-operation	2	3
i)	Increased gender equality	1	1

7. Regulatory and legislative environment		Scale of Expected Impacts over the next 10 years (2)	
		By Project End -1 0 1 2 3	After Project End -1 0 1 2 3
a)	Contribution to EU policy formulation	2	3
b)	Contribution to EU policy implementation	2	3

8. Other (please specify)		Scale of Expected Impacts over the next 10 years (2)	
		By Project End -1 0 1 2 3	After Project End -1 0 1 2 3

I, **project co-ordinator**, confirm the published information contained in this part 1 of the TIP.

Signature:

Name: D. Buckthorpe

Date: 30th November 2004

Organisation: NNC Ltd.

Part 2 Description of each result

A separate part 2 must be completed for each result. This may be done by the partner responsible for the result or by the project co-ordinator.

The part 2 must be consolidated at the consortium level and transmitted to the Commission by the co-ordinator.

PARTS 2 WILL BE DISSEMINATED BY THE COMMISSION

2.1 : Description of the result(s), one form per result**No. & TITLE OF RESULT** (same as in table 1.2)

No.	Self-descriptive title of the result
1	Review of vessel materials & establishing data base for HTR

CONTACT PERSON FOR THIS RESULT

Name	Mr. Derek Buckthorpe
Position	Senior Consultant Engineer
Organisation	National Nuclear Corporation Limited.
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Telephone	00 44 (0)1565 84 3845
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E-mail	Derek.buckthorpe@nnc.co.uk
URL	
Specific Result URL	

SUMMARY (200 words maximum)

Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.

This result provides a review of past Gas Cooled Reactor Vessel experience and will identify material data omissions and requirements to aid the selection of a material for testing. The work will take account of the collective experience and knowledge of the partnership on vessel materials for existing high temperature and gas cooled reactors. The technological review covers the identification of important areas to be studied (considering geometrical discontinuities, welds, zones, etc.) and the applied loading and damage mechanisms placing emphasis on material limits and temperature applicability and looking at as-fabricated and end of life conditions.

The data base activity uses experiences from established computer based systems and design code material formats and is to be set up to enable easy transfer of data between partners. The database will cover available design properties for base material and weldment options for the key material alternatives including references to weld procedures, treatments, manufacturing and requirements for integrity assessments (stress limits, fatigue, creep, etc.) and fracture based properties (applicable to Leak before Break) and defect assessment procedures (inc. flaw evaluation). The results are coordinated with activities on the high temperature materials to ensure no duplication and a consistency in presentation and content.

The results are provided over a series of technical Reports (see below) and summarised within Deliverables 1.1 to 1.3 of the Project

Please categorise the result using codes from Annex 1

Subject descriptors	373 materials	531 reactor	150 Data	98 CEFC	373 materials
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CURRENT STAGE OF DEVELOPMENT

Please tick one category only 

Scientific and/or Technical knowledge (Basic research)	☐ Y
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT

List main information and documentation, stating whether public or confidential.

Documentation type	Details (Title, ref. number, general description, language)	Status: PU=Public CO=Confidential
Technical Report	HTR-M 01/9 D-1.1.9 Preliminary Review of RPV materials used on HTR and other gas cooled reactors. (English)	CO
Technical Report	HTR-M 01/10-D.1.1.17 Materials selection for HTR Vessel (English)	CO
Technical Report	HTR-M 01/10-D.1.1.18 Report on Damage Mechanisms for Vessel (English)	CO
Technical Report	HTR-M 01/3-D.0.0.21 HTR-M Material Data Base- scope and proposed stages of development (English)	CO
Technical Report	HTR-M 02/2-D.1.1.27 HTR RPV Materials Damage Mechanisms (English)	CO
Technical Report	HTR-M 02/2-D.1.1.28 HTR RPV Sensitive Zones (English)	CO
Technical Report	HTR-M 02/2-D.1.1.31 HTR - Identification and review of Pressure Vessel candidate materials (English)	CO
Technical Report	HTR-M 02/8-D.1.1.40 WP1 Task 1.5 Design Rule check (English)	CO
Technical Report	HTR-M 02/8-D.1.1.41 HTR Compared properties of Pressure Vessel candidate materials (English)	CO
Technical Report	HTR-M 02/11 D 1 1 48 Review of irradiation and thermal ageing effects in Modified 9 Cr 1 Mo steel (English)	CO
Technical Report	HTR-M 02/11 D 1 1 49 State of the Art review of HTR Materials (English)	CO
Technical Report	HTR-M 02/11 D 0 0 50 HTR-M Vessel Materials Database (English)	CO
Technical Report	HTR-M 02/11 D 0 0 51 HTR-M vessel materials data base (English)	CO
Technical Report	HTR-M 03/5 D 1 1 70 Effect of environment on the material of GT-MHR Vessel	CO
Technical data sheet	HTR-M 03/8 D 0 0 75 HTR-M metal materials Database (BLANK)	CO
Publication	HTR RPV Materials, paper 3355, ICAPP03 Conference, Cordoba, Spain, 4-7 May 2003	PU

INTELLECTUAL PROPERTY RIGHTS

<u>Type of IPR</u>	<u>KNOWLEDGE:</u> Tick a box and give the corresponding details (reference numbers, etc) if appropriate				<u>Pre-existing know-how</u> Tick a box and give the corresponding details(reference numbers, etc) if appropriate		
	Current				Foreseen	Tick	Details
	Tick	NoP ¹⁾	NoI ²⁾	Details	Tick		
Patent applied for	☐				☐	☐	
Patent granted	☐				☐	☐	
Patent search carried out	☐				☐	☐	
Registered design	☐				☐	☐	
Trademark applications	☐				☐	☐	
Copyrights	☐				☐	☐	
Secret know-how	☐				☐	☐	
Other - please specify :	☐				☐	☐	

1) Number of **P**riority (national) applications/patents

2) Number of **I**nternationally extended applications/patents

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	40				
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2.2. Quantified data about the result

Items (about the results)	Actual current quantity ^a	Estimated (or future) quantity ^b
Time to application / market (in months from the end of the research project)	immediate	Applicable to FP6 and beyond
Number of (public or private) entities potentially involved in the implementation of the result :	7 partners	21
of which : number of SMEs :	0	
of which : number of entities in third countries (outside EU) :	0	1
Targeted user audience: # of reachable people	50-100: HTR-TN & Eurocourse	Gen IV Members
# of S&T publications (referenced publications only)	1	
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	0	
# of publications addressing decision takers / public authorities / etc.	0	
Visibility for the general public	No	

^a Actual current quantity = the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.

2.3. Further collaboration, dissemination and use of the result

(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)

COLLABORATIONS SOUGHT

Please tick appropriate boxes (☐) corresponding to your needs.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ Y
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
			Other	(please specify)	☐

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

R & D on vessel and related Technology

Further R & D within the 6th Framework partnership of Raphael-IP

Further R & D within the 7th Framework Programme.

Collaborative development of HTR-10, PBMR

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

Raphael-IP partnership within Sub project on vessel materials

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature :

Name: Derek Buckthorpe

Date: 1st Novemebr 2004

Organisation: National Nuclear Corporation Limited

2.1 : Description of the result(s), one form per result**No. & TITLE OF RESULT** (same as in table 1.2)

No.	Self-descriptive title of the result
2	Vessel material test results under irradiated and non irradiated conditions

CONTACT PERSON FOR THIS RESULT

Name	Mr. Derek Buckthorpe
Position	Senior Consultant Engineer
Organisation	National Nuclear Corporation Limited.
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Fax	00 44 (0)1565 84 3878
E-mail	Derek.buckthorpe@nnc.co.uk
URL	
Specific Result URL	

SUMMARY (200 words maximum)

Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.

The key issues addressed are the integrity aspects of a selected vessel material with regard to the effects of irradiation damage for conditions representative of the temperature and fluence of HTR

The work covers the results of an experimental programme on representative vessel weld features under non irradiated and irradiated conditions. The experiments are performed on a selected material (taking account of the review and data base results) and the work includes the procurement of welded test pieces and the machining of tensile, creep and / or compact tension fracture specimens as required. The experimental programme concentrates on the properties of a relevant weld material, both in the as-fabricated state and after irradiation to end-of-life neutron fluence conditions. The irradiation tests are performed on selected plate and weld materials under relevant HTR conditions using the pool side of the high flux reactor facilities with post irradiation examination carried out in their hot cell facilities. Results from this work are reviewed and are to be included in the material database.

The results are provided over a series of technical Reports (see below) and is summarised within Deliverables 1.4 and 1.5 of the Project

Please categorise the result using codes from Annex 1

Subject descriptors	373 Materials	531 Reactor	436 Nuc E & T	611 Testing	373 Materials
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CURRENT STAGE OF DEVELOPMENT

Please tick one category only 

Scientific and/or Technical knowledge (Basic research)	☐ Y
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT

List main information and documentation, stating whether public or confidential.

Documentation type	Details (Title, ref. number, general description, language)	Status: PU=Public CO=Confidential
Technical Report	HTR-M 03/2 D-1.4.63 Specifications for Test Matrix for RPV Test Programme (English)	CO
Technical Report	HTR-M 03/8 D 1 4 78 Proposed Creep Rupture test conditions for the HTR-M irradiation experiment on Mod 9Cr 1 Mo steel	CO
Technical Report	HTR-M 03/11 D 1 3 82 Modified 9Cr 1 Mo steel, Manufacturing of Welded Joint materials	CO
Technical Report	HTR-M 04/5 D 1 4 88 Activation analysis – (up to 500 days after irradiation) of the Vessel steel Modified 9Cr 1 Mo for the LYRA experiment	CO
Technical Report	HTR-M 04/10 D 1 4 99 Results of testing and irradiation behaviour of Mod 9Cr 1 Mo steel RPV welds and base material.	CO
Technical Report	HTR-M 04/10 D 1 5 97 Weldments for Reactor Pressure Vessels – a guide to qualification, quality assurance and defect assessment	CO
Technical Report	HTR-M 04/10 D 1 4 98 HTR-M Vessel materials – evaluation of weld factor	CO

INTELLECTUAL PROPERTY RIGHTS

<u>Type of IPR</u>	<u>KNOWLEDGE:</u> Tick a box and give the corresponding details (reference numbers, etc) if appropriate				<u>Pre-existing know-how</u> Tick a box and give the corresponding details(reference numbers, etc) if appropriate	
	Current				Foreseen	
	Tick	NoP ¹⁾	NoI ²⁾	Details	Tick	Details
Patent applied for	☐				☐	
Patent granted	☐				☐	
Patent search carried out	☐				☐	
Registered design	☐				☐	
Trademark applications	☐				☐	
Copyrights	☐				☐	
Secret know-how	☐				☐	
Other - please specify :	☐				☐	

1) Number of **P**riority (national) applications/patents

2) Number of **I**nternationally extended applications/patents

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	40				
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2.2. Quantified data about the result

Items (about the results)	Actual current quantity ^a	Estimated (or future) quantity ^b
Time to application / market (in months from the end of the research project)	immediate	Applicable to FP6 and beyond
Number of (public or private) entities potentially involved in the implementation of the result :	7 partners	21
of which : number of SMEs :	0	
of which : number of entities in third countries (outside EU) :	0	1
Targeted user audience: # of reachable people	50-100: HTR-TN & Eurocourse	Gen IV Members
# of S&T publications (referenced publications only)	0	
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	0	
# of publications addressing decision takers / public authorities / etc.	0	
Visibility for the general public	No	

^a Actual current quantity = the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.

2.3. Further collaboration, dissemination and use of the result

(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)

COLLABORATIONS SOUGHT

Please tick appropriate boxes (☐) corresponding to your needs.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ Y
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
			Other	(please specify)	☐

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

Further R & D on Vessel Technology within the 6th Framework partnership of Raphael-IP

Further R & D within the 6th Framework partnership of Raphael-IP

Further R & D within the 7th Framework Programme.

Collaborative development of HTR-10, PBMR

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

Raphael-IP partnership within Sub project on vessel materials

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature :

Name: D. Buckthorpe

Date: 1st November 2004

Organisation: National Nuclear Corporation Limited

2.1 : Description of the result(s), one form per result**No. & TITLE OF RESULT** (same as in table 1.2)

No.	Self-descriptive title of the result
3	Summary Report of vessel material investigations for HTR

CONTACT PERSON FOR THIS RESULT

Name	Mr. Derek Buckthorpe
Position	Senior Consultant Engineer
Organisation	National Nuclear Corporation Limited.
Address	Booths Hall, Chelford Road, Knutsford, Cheshire, UK
Telephone	00 44 (0)1565 84 3845
Fax	00 44 (0)1565 84 3878
E-mail	Derek.buckthorpe@nnc.co.uk
URL	
Specific Result URL	

SUMMARY (200 words maximum)

Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.

This reports the results of the vessel material investigations and covers a review and synthesis for feasibility of the work performed on vessel materials for the HTR. The review and synthesis will include results of the irradiation test work and examination.

The work on vessel materials will yield the following results:

- Review of materials for former HTR's and gas cooled reactors.
- Database on pressure vessel steel plate and weld material relevant for HTR RPV applications
- Recommendations for HTR RPV feasibility, choice of material, suitability for manufacture, environment and welding.
- Irradiation data for HTR RPV relevant irradiation conditions (helium, temperature and fluence) on selected properties of the HTR steel and weld

The results are provided in the form of a technical report and deliverable 1.6 of the project.

Please categorise the result using codes from Annex 1

Subject descriptors	373 Materials	531 Reactor	436 Nuc E & T	150 Data	373 Materials
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CURRENT STAGE OF DEVELOPMENT

Please tick one category only 

Scientific and/or Technical knowledge (Basic research)	☐ Y
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT

List main information and documentation, stating whether public or confidential.

Documentation type	Details (Title, ref. number, general description, language)	Status: <i>PU</i> =Public <i>CO</i> =Confidential
Technical Report	HTR-M 04/10 D 1 5 100 HTR-M Summary Report on Vessel Materials	CO

INTELLECTUAL PROPERTY RIGHTS

<u>Type of IPR</u>	<u>KNOWLEDGE:</u> Tick a box and give the corresponding details (reference numbers, etc) if appropriate				<u>Pre-existing know-how</u> Tick a box and give the corresponding details(reference numbers, etc) if appropriate		
	Current				Foreseen	Tick	Details
	Tick	NoP ¹⁾	NoI ²⁾	Details	Tick		
Patent applied for	☐				☐	☐	
Patent granted	☐				☐	☐	
Patent search carried out	☐				☐	☐	
Registered design	☐				☐	☐	
Trademark applications	☐				☐	☐	
Copyrights	☐				☐	☐	
Secret know-how	☐				☐	☐	
Other - please specify :	☐				☐	☐	

1) Number of **P**riority (national) applications/patents

2) Number of **I**nternationally extended applications/patents

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	40				
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2.2. Quantified data about the result

Items (about the results)	Actual current quantity ^a	Estimated (or future) quantity ^b
Time to application / market (in months from the end of the research project)	immediate	Applicable to FP6 and beyond
Number of (public or private) entities potentially involved in the implementation of the result :	7 partners	21
of which : number of SMEs :	0	
of which : number of entities in third countries (outside EU) :	0	1
Targeted user audience: # of reachable people	50-100: HTR-TN & Eurocourse	Gen IV Members
# of S&T publications (referenced publications only)	1	
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	0	
# of publications addressing decision takers / public authorities / etc.	0	
Visibility for the general public	No	

^a Actual current quantity = the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.

2.3. Further collaboration, dissemination and use of the result

(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)

COLLABORATIONS SOUGHT

Please tick appropriate boxes (☐) corresponding to your needs.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ Y
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
			Other	(please specify)	☐ Y

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

Further R & D on vessel materials technology within the 6th Framework partnership of Raphael-IP

Further R & D within the 6th Framework partnership of Raphael-IP

Further R & D within the 7th Framework Programme.

Collaborative development of HTR-10, PBMR

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

Raphael-IP partnership within Sub project on vessel materials

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature:

Name: D.Buckthorpe

Date: 1st November 2004

Organisation: National Nuclear Corporation Limited

2.1 : Description of the result(s), one form per result**No. & TITLE OF RESULT** (same as in table 1.2)

No.	Self-descriptive title of the result
4	Review & establishing data base for materials for the high temperature structures (internals & turbine) of HTR.

CONTACT PERSON FOR THIS RESULT

Name	Mr. Derek Buckthorpe
Position	Senior Consultant Engineer
Organisation	National Nuclear Corporation Limited.
Address	Booths Hall, Chelford Road, Knutsford, Cheshire, UK
Telephone	00 44 (0)1565 84 3845
Fax	00 44 (0)1565 84 3878
E-mail	Derek.buckthorpe@nnc.co.uk
URL	
Specific Result URL	

SUMMARY (200 words maximum)

Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.

The work covers a review of possible materials for the high temperature components taking account of HTR operation under accident and normal operation and design property evaluation and analyses using existing tools. The data base of properties takes account of experience on existing high temperature and gas cooled reactors, to provide a basis for a recommendation for the internal structures (especially the control rod) and options for the turbine (turbine disc and blades) and to identify data omissions. The activities for the turbine material takes account of recently developed casting and manufacturing processes (i. e. powder metallurgy) and experience on super alloys and composites in other industries. The database includes a reference to material composition, microstructure, manufacture (products and parts, etc.). The results are co-ordinated with those of the vessel material to ensure no duplication and a consistency in presentation and content.

The results are provided over a series of technical Reports (see below) and summarised within Deliverables 2.1 to 2.7 of the Project

Please categorise the result using codes from Annex 1

Subject descriptors	373 materials	531 reactor	150 Data	98 CEFC	373 materials
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CURRENT STAGE OF DEVELOPMENT

Please tick one category only 

Scientific and/or Technical knowledge (Basic research)	☐ Y
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT

List main information and documentation, stating whether public or confidential.

Documentation type	Details (Title, ref. number, general description, language)	Status: PU=Public CO=Confidential
Technical Report	HTR-M 01/9 D-2.0.12 HTR-M WP2, Milestone 2 Materials Review and database (English)	CO
	HTR-M 01/9 M 2 0 13 Bibliography of of papares for HTR-M work	CO
Technical Report	HTR-M 01/9 D-2.1.14 HTR-M Design use and specification for internals (English)	CO
Technical Report	HTR-M 01/9 D-2.1.19 HTR-M Design use and Specification for Turbine (English)	CO
Technical Report	HTR-M 01/9 D-2.0.23 Information needs on “Turbine design and operating conditions” for the choice of high temperature materials and experimental tests conditions (English)	CO
Technical Report	HTR-M 01/9 D-2.1.32 HTR: - Identification and review of Turbine candidate materials	CO
Technical Report	HTR-M 01/9 D-2.1.36 Materials for the Core and Internals: Synthesis of Materials Database	CO
Technical Report	HTR-M 01/9 D-2.1.39 Materials for the turbine: syntesis of materials database	CO
Technical Report	HTR-M 03/1 D 2 2 61 Materials selection for HTR power Turbine	CO
Meeting Notes	HTR-M 03/7 M 2 0 72 Notes of a specialist meeting on Corrosion & Carburisation	CO
Technical data sheet	HTR-M 03/8 D 0 0 75 HTR-M metal materials Database (BLANK)	CO
Technical data sheet	HTR-M 03/8 D 0 0 76 HTR-M C-based materials Database (BLANK)	CO
Technical Report	HTR-M 04/4 D 2 1 86 HTR-M WP2.1 - Carbon-Carbon Composite control Rods. Reassessment of remaining programme	CO
Technical Report	HTR-M 04/4 D 2 1 87 HTR-M WP2.1 - Carbon-Carbon Composite control Rods, past experience of FZJ on C/C mechanical testing for HTR development	CO

Technical Report	HTR-M 04/5 D 2 1 89 HTR-M WP2.1 – Carbon-Carbon Composite Control Rods. Report on discussions with manufacturers	CO
Technical Report	HTR-M 04/7 D 2 1 95 Requirements for Control Rods with HTR conditions	CO
Technical Report	HTR-M 04/7 D 2 2 94 Materials and Manufacture of discs – feasibility of large Turbine disc production	CO
Technical Report	HTR-M 05/1 D 2 1 106 Notes of a meeting with Dunlop on C-C Composites for Control Rods	CO
Technical Forum	Presentations at a Forum on C/C Composite Materials held at NRG Petten, 17/18 th February 2004	PU

INTELLECTUAL PROPERTY RIGHTS

<u>Type of IPR</u>	<u>KNOWLEDGE:</u> Tick a box and give the corresponding details (reference numbers, etc) if appropriate				<u>Pre-existing know-how</u> Tick a box and give the corresponding details(reference numbers, etc) if appropriate		
	Current				Foreseen	Tick	Details
	Tick	NoP ¹⁾	NoI ²⁾	Details	Tick		
Patent applied for	☐				☐	☐	
Patent granted	☐				☐	☐	
Patent search carried out	☐				☐	☐	
Registered design	☐				☐	☐	
Trademark applications	☐				☐	☐	
Copyrights	☐				☐	☐	
Secret know-how	☐				☐	☐	
Other - please specify :	☐				☐	☐	

1) Number of **P**riority (national) applications/patents

2) Number of **I**nternationally extended applications/patents

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	40				
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2.2. Quantified data about the result

Items (about the results)	Actual current quantity ^a	Estimated (or future) quantity ^b
Time to application / market (in months from the end of the research project)	immediate	Applicable to FP6 and beyond
Number of (public or private) entities potentially involved in the implementation of the result :	7 partners	21
of which : number of SMEs :	0	
of which : number of entities in third countries (outside EU) :	0	1
Targeted user audience: # of reachable people	50-100: HTR-TN & Eurocourse, related ISTC projects	Gen IV Members
# of S&T publications (referenced publications only)	1	
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	0	
# of publications addressing decision takers / public authorities / etc.	0	
Visibility for the general public	No	

^a Actual current quantity = the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.

2.3. Further collaboration, dissemination and use of the result

(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)

COLLABORATIONS SOUGHT

Please tick appropriate boxes (☐) corresponding to your needs.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ Y
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
			Other	(please specify)	☐

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

Further R & D on high Temperature Materials within the 6th Framework partnership of Raphael-IP & Extremat

Further R & D within the 6th Framework partnership of Raphael-IP

Further R & D within the 7th Framework Programme.

Collaborative development of HTR-10, PBMR

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

Raphael-IP partnership within Sub project on high temperature materials

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature :

Name: D. Buckthorpe

Date: 1st November 2004

Organisation: National Nuclear Corporation Limited

2.1 : Description of the result(s), one form per result**No. & TITLE OF RESULT** (same as in table 1.2)

No.	Self-descriptive title of the result
5	Investigation and testing of materials for the high temperature structures (control rod & turbine(blades & disc)) of HTR.

CONTACT PERSON FOR THIS RESULT

Name	Mr. Derek Buckthorpe
Position	Position
Organisation	National Nuclear Corporation Limited.
Address	Booths Hall, Chelford Road, Knutsford, Cheshire, UK
Telephone	00 44 (0)1565 84 3845
Fax	00 44 (0)1565 84 3878
E-mail	Derek.buckthorpe@nnc.co.uk
URL	
Specific Result URL	

SUMMARY (200 words maximum)

Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.

This covers test work and modeling investigations needed to quantify the material in the HTR environment for the reactor internals and for the turbine.

For the reactor internals effort is focused on the control rod and the development of a test matrix to deal with any additional properties required. The task covers the supply and manufacture of specimens and limited testing to quantify the material in the HTR environment and provide important missing information.

For the materials for the turbine (disc & blades) aspects of materials development and processing are considered for selected options of alloys made to chosen manufacturing routes. Material processing and material selection aspects are investigated, taking account of experience from turbine manufacturers. High temperature mechanical tests are performed on selected grades of alloys and to assess environmental effects, including tensile testing (air, vacuum), short term creep testing (air, helium, vacuum) and fatigue testing in air. Cyclic loading conditions, in addition to the creep loading is investigated on a limited number of high temperature isothermal creep-fatigue, or thermo-mechanical fatigue tests in He. The work identifies future test requirements for long term use of the selected materials

The results are provided over a series of technical Reports (see below) and summarised within Deliverables 2.8 & 2.9 of the Project

Please categorise the result using codes from Annex 1

Subject descriptors	373 Materials	531 Reactor	436 Nuc E & T	611 Testing	373 Materials
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CURRENT STAGE OF DEVELOPMENT

Please tick one category only 

Scientific and/or Technical knowledge (Basic research)	☐ Y
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT

List main information and documentation, stating whether public or confidential.

Documentation type	Details (Title, ref. number, general description, language)	Status: <i>PU</i> =Public <i>CO</i> =Confidential
Technical Report	HTR-M 02/6 D-2.2.35 Materials for Turbine: Definition of Complimentary testing experiments	CO
Technical Report	HTR-M 03/12 D 2 3 84 Materials for Turbine: Report on Preliminary Materials testing	CO

INTELLECTUAL PROPERTY RIGHTS

<u>Type of IPR</u>	<u>KNOWLEDGE:</u> Tick a box and give the corresponding details (reference numbers, etc) if appropriate				<u>Pre-existing know-how</u> Tick a box and give the corresponding details(reference numbers, etc) if appropriate	
	Current				Foreseen	
	Tick	NoP ¹⁾	NoI ²⁾	Details	Tick	Details
Patent applied for	☐				☐	
Patent granted	☐				☐	
Patent search carried out	☐				☐	
Registered design	☐				☐	
Trademark applications	☐				☐	
Copyrights	☐				☐	
Secret know-how	☐				☐	
Other - please specify :	☐				☐	

1) Number of **P**riority (national) applications/patents

2) Number of **I**nternationally extended applications/patents

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	40				
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2.2. Quantified data about the result

Items (about the results)	Actual current quantity ^a	Estimated (or future) quantity ^b
Time to application / market (in months from the end of the research project)	immediate	Applicable to FP6 and beyond
Number of (public or private) entities potentially involved in the implementation of the result :	7 partners	21
of which : number of SMEs :	0	
of which : number of entities in third countries (outside EU) :	0	1
Targeted user audience: # of reachable people	50-100: HTR-TN & Eurocourse, related ISTC projects	Gen IV Members
# of S&T publications (referenced publications only)		
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	0	
# of publications addressing decision takers / public authorities / etc.	0	
Visibility for the general public	No	

^a Actual current quantity = the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.

2.3. Further collaboration, dissemination and use of the result

(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)

COLLABORATIONS SOUGHT

Please tick appropriate boxes (☐) corresponding to your needs.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange	☐
JV	Joint venture	☐	CONS	Available for consultancy	☐
			Other	(please specify)	☐

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

Further R & D ON high Temperature Materials within the 6th Framework partnerships of Raphael-IP and Extremat-IP

Further R & D within the 6th Framework partnership of Raphael-IP

Further R & D within the 7th Framework Programme.

Collaborative development of HTR-10, PBMR

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

Raphael-IP partnership within Sub project on high temperature materials

Extremat-IP partnership involved in Fission Technology

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature :

Name: D. Buckthorpe

Date: 1st November 2004

Organisation: National Nuclear Corporation Limited

2.1 : Description of the result(s), one form per result**No. & TITLE OF RESULT** (same as in table 1.2)

No.	Self-descriptive title of the result
6	Summary report of high temperature materials for the high temperature structures (internals & turbine) of HTR.

CONTACT PERSON FOR THIS RESULT

Name	Mr. Derek Buckthorpe
Position	Senior Consultant Engineer
Organisation	National Nuclear Corporation Limited.
Address	Booths Hall, Chelford Road, Knutsford, Cheshire, UK
Telephone	00 44 (0)1565 84 3845
Fax	00 44 (0)1565 84 3878
E-mail	Derek.buckthorpe@nnc.co.uk
URL	
Specific Result URL	

SUMMARY (200 words maximum)

Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.

This reports the results of the high temperature material investigations and covers a review and synthesis for feasibility investigations for materials for the HTR. The results of the test programmes are summarised and transferred to the database as appropriate:

The work on high temperature materials yields the following results:

- Database on selected internal structures and turbine materials relevant for HTR applications
- Recommendations for HTR, choice of material, development and material processing

Short and medium term testing to provide missing data for selected properties and mechanical characterisation and recommendations for future work to quantify long term capability of the chosen materials

The result is provided in the form of a technical Reports (see below) summarised within Deliverables 2.5 & 2.10 of the Project

Please categorise the result using codes from Annex 1

Subject descriptors	373 Materials	531 Reactor	436 Nuc E & T	150 Data	373 Materials
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CURRENT STAGE OF DEVELOPMENT

Please tick one category only 

Scientific and/or Technical knowledge (Basic research)	☐ Y
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT

List main information and documentation, stating whether public or confidential.

Documentation type	Details (Title, ref. number, general description, language)	Status: PU=Public CO=Confidential
Technical Report	HTR-M 04/10 D 2 1 102 Materials for the Core & Internals: report on results form HTR-M investigations on C/C Composite material	CO
Technical Report	HTR-M 04/10 D 2 3 103 Materials for the Turbine: Report on results form HTR-M investigations	CO

INTELLECTUAL PROPERTY RIGHTS

<u>Type of IPR</u>	<u>KNOWLEDGE:</u> Tick a box and give the corresponding details (reference numbers, etc) if appropriate				<u>Pre-existing know-how</u> Tick a box and give the corresponding details(reference numbers, etc) if appropriate		
	Current				Foreseen	Tick	Details
	Tick	NoP ¹⁾	NoI ²⁾	Details	Tick		
Patent applied for	☐				☐	☐	
Patent granted	☐				☐	☐	
Patent search carried out	☐				☐	☐	
Registered design	☐				☐	☐	
Trademark applications	☐				☐	☐	
Copyrights	☐				☐	☐	
Secret know-how	☐				☐	☐	
Other - please specify :	☐				☐	☐	

1) Number of **P**riority (national) applications/patents

2) Number of **I**nternationally extended applications/patents

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	40				
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2.2. Quantified data about the result

Items (about the results)	Actual current quantity ^a	Estimated (or future) quantity ^b
Time to application / market (in months from the end of the research project)	immediate	Applicable to FP6 and beyond
Number of (public or private) entities potentially involved in the implementation of the result :	7 partners	21
of which : number of SMEs :	0	
of which : number of entities in third countries (outside EU) :	0	1
Targeted user audience: # of reachable people	20-100: HTR-TN & Eurocourse, related ISTC projects	Gen IV Members
# of S&T publications (referenced publications only)	0	
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	0	
# of publications addressing decision takers / public authorities / etc.	0	
Visibility for the general public	No	

^a Actual current quantity = the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.

2.3. Further collaboration, dissemination and use of the result

(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)

COLLABORATIONS SOUGHT

Please tick appropriate boxes (☐) corresponding to your needs.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ Y
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
			Other	(please specify)	☐

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

Further R & D on high Temperature materials within the 6th Framework partnership of Raphael-IP and Extremat-IP

Further R & D within the 6th Framework partnership of Raphael-IP

Further R & D within the 7th Framework Programme.

Collaborative development of HTR-10, PBMR

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

Raphael-IP partnership within Sub project on high temperature materials

Partners of Extremat-IP concerned with Fission Gas cooled Reactors

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature :

Name: D. Buckthorpe

Date: 1st Novemebr 2004

Organisation: National Nuclear Corporation Limited

2.1 : Description of the result(s), one form per result**No. & TITLE OF RESULT** (same as in table 1.2)

No.	Self-descriptive title of the result
7	Review of graphite materials & data /selection for HTR

CONTACT PERSON FOR THIS RESULT

Name	Mr. Derek Buckthorpe
Position	Senior Consultant Engineer
Organisation	National Nuclear Corporation Limited.
Address	Booths Hall, Chelford Road, Knutsford, Cheshire, UK
Telephone	00 44 (0)1565 84 3845
Fax	00 44 (0)1565 84 3878
E-mail	Derek.buckthorpe@nnc.co.uk
URL	
Specific Result URL	

SUMMARY (200 words maximum)

Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.

Graphite acts as a moderator and structural component and has important safety implications because of structural and other property changes that occur when it is irradiated. The Graphite review activities focus on data collection and retention of existing experience so as to establish a platform of relevant material data. The work considers past and new graphites taking account of the available experience on HTR's and currently operating gas cooled reactors. The review and data collection activity includes aspects such as production, testing, examination and application. Assessment of new graphites is done to provide a starting point for future HTR's. The established database also provides a means for assessing the suitability or otherwise of any potential candidates and of any testing requirements needed to confirm these properties. Information on CFC and Si-C materials from the Fusion programme are contributed into this process, as the results are available.

The results are provided over a series of technical Reports (see below) and summarised within Deliverables 3.1 to 3.3 of the Project

Please categorise the result using codes from Annex 1

Subject descriptors	373 materials	531 reactor	150 Data	98 CEEC	373 materials
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CURRENT STAGE OF DEVELOPMENT

Please tick one category only 

Scientific and/or Technical knowledge (Basic research)	☐ Y
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT

List main information and documentation, stating whether public or confidential.

Documentation type	Details (Title, ref. number, general description, language)	Status: PU=Public CO=Confidential
Technical Report	HTR-M 02/6 D-3.1 37 State of Art review of graphite materials behaviour	CO
Technical Report	HTR-M 02/6 D-3.1 38 Report on database of properties suitable for use by designer	CO
Technical Report	HTR-M 2/11 D 3 2 53 Assess new potential graphites and needs of HTR	CO
Technical Report	HTR-M 03/8 D 0 0 77 HTR-M graphite materials database (BLANK)	CO

INTELLECTUAL PROPERTY RIGHTS

<u>Type of IPR</u>	<u>KNOWLEDGE:</u> Tick a box and give the corresponding details (reference numbers, etc) if appropriate				<u>Pre-existing know-how</u> Tick a box and give the corresponding details(reference numbers, etc) if appropriate	
	Current				Foreseen	
	Tick	NoP ¹⁾	NoI ²⁾	Details	Tick	Details
Patent applied for	☐				☐	
Patent granted	☐				☐	
Patent search carried out	☐				☐	
Registered design	☐				☐	
Trademark applications	☐				☐	
Copyrights	☐				☐	
Secret know-how	☐				☐	
Other - please specify :	☐				☐	

1) Number of **P**riority (national) applications/patents

2) Number of **I**nternationally extended applications/patents

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	40				
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2.2. Quantified data about the result

Items (about the results)	Actual current quantity ^a	Estimated (or future) quantity ^b
Time to application / market (in months from the end of the research project)	immediate	Applicable to FP6 and beyond
Number of (public or private) entities potentially involved in the implementation of the result :	7 partners	21
of which : number of SMEs :	0	
of which : number of entities in third countries (outside EU) :	0	1
Targeted user audience: # of reachable people	50-100: HTR-TN & Eurocourse	Gen IV Members
# of S&T publications (referenced publications only)	0	
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	0	
# of publications addressing decision takers / public authorities / etc.	0	
Visibility for the general public	No	

^a Actual current quantity = the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.

2.3. Further collaboration, dissemination and use of the result

(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)

COLLABORATIONS SOUGHT

Please tick appropriate boxes (☐) corresponding to your needs.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ Y
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
			Other	(please specify)	☐

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

Further R & D within the 6th Framework partnerships of Raphael-IP and Extremat-IP

Further R & D within the 6th Framework partnership of Raphael-IP

Further R & D within the 7th Framework Programme.

Collaborative development of HTR-10, PBMR

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

Further R & D within the 6th Framework partnership of Raphael-IP

Partnership within Extremat-IP interested in Gas reactor Fission technology, C-Composites and graphite development

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature :

Name: D. Buckthorpe

Date: 1st November 2004

Organisation: National Nuclear Corporation Limited

2.1 : Description of the result(s), one form per result**No. & TITLE OF RESULT** (same as in table 1.2)

No.	Self-descriptive title of the result
8	Graphite test results for effects of oxidation associated with severe air ingress of HTR.

CONTACT PERSON FOR THIS RESULT

Name	Mr. Derek Buckthorpe
Position	Senior Consultant Engineer
Organisation	National Nuclear Corporation Limited.
Address	Booths Hall, Chelford Road, Knutsford, Cheshire, UK
Telephone	00 44 (0)1565 84 3845
Fax	00 44 (0)1565 84 3878
E-mail	Derek.buckthorpe@nnc.co.uk
URL	
Specific Result URL	

SUMMARY (200 words maximum)

Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.

The graphite oxidation work of HTR-M covers two principal tasks relevant to safety analysis and licensing for normal operation:

1. an understanding of severe air ingress with core burning,
2. innovative C-based materials

The thermo-gravimetric facility THERA is used to measuring kinetics of A3 fuel matrix graphite (type A3-27) and of a typical structural graphite (V483T fine grain graphite) in oxygen at temperatures between 823 and 1023 °K and oxygen partial pressures between 2 and 20 kPa.

Oxidation of innovative C-based materials is also examined at accident typical temperatures (about 1273 °K) in steam and in air. Materials are selected, supplied, pre-characterised and examined. Testing is carried out using the oxidation facility INDEX, using induction heating for the tube shaped test samples. Oxidising gas is passed through the inner bore hole of the tube with flow rates at a sufficiently high rate for suppression of an influence of boundary layer mass transfer on kinetics. Oxidation is measured by mass spectrometric analysis of the exit duct / product gases and by weight loss of the sample.

The results are provided within a series of Technical Reports (see below) and produced as deliverables 3.4 & 3.5 of the project.

Please categorise the result using codes from Annex 1

Subject descriptors	373 Materials	531 Reactor	436 Nuc E & T	611 Testing	373 Materials
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CURRENT STAGE OF DEVELOPMENT

Please tick one category only 

Scientific and/or Technical knowledge (Basic research)	☐ Y
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT

List main information and documentation, stating whether public or confidential.

Documentation type	Details (Title, ref. number, general description, language)	Status: PU=Public CO=Confidential
Technical Report	HTR-M 02/12 D 3 3 55 Oxidation resistance of Carbon based materials	CO
Technical Report	HTR-M 02/12 D 3 3 56 Chemical kinetic data for advanced oxidation models	CO
Conference Publication	Behaviour of C-Based Materials in contact to oxidising gases, paper 3031, ICAPP03 Conference, Cordoba, Spain, 4-7 May 2003	CO

INTELLECTUAL PROPERTY RIGHTS

<u>Type of IPR</u>	<u>KNOWLEDGE:</u> Tick a box and give the corresponding details (reference numbers, etc) if appropriate				<u>Pre-existing know-how</u> Tick a box and give the corresponding details(reference numbers, etc) if appropriate		
	Current				Foreseen	Tick	Details
	Tick	NoP ¹⁾	NoI ²⁾	Details	Tick		
Patent applied for	☐				☐	☐	
Patent granted	☐				☐	☐	
Patent search carried out	☐				☐	☐	
Registered design	☐				☐	☐	
Trademark applications	☐				☐	☐	
Copyrights	☐				☐	☐	
Secret know-how	☐				☐	☐	
Other - please specify :	☐				☐	☐	

1) Number of **P**riority (national) applications/patents

2) Number of **I**nternationally extended applications/patents

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	40				
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2.2. Quantified data about the result

Items (about the results)	Actual current quantity ^a	Estimated (or future) quantity ^b
Time to application / market (in months from the end of the research project)	immediate	Applicable to FP6 and beyond
Number of (public or private) entities potentially involved in the implementation of the result :	7 partners	21
of which : number of SMEs :	0	
of which : number of entities in third countries (outside EU) :	0	1
Targeted user audience: # of reachable people	20-100: HTR-TN & Eurocourse	Gen IV Members
# of S&T publications (referenced publications only)	1	
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	0	
# of publications addressing decision takers / public authorities / etc.	0	
Visibility for the general public	No	

^a Actual current quantity = the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.

2.3. Further collaboration, dissemination and use of the result

(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)

COLLABORATIONS SOUGHT

Please tick appropriate boxes (☐) corresponding to your needs.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ Y
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
			Other	(please specify)	☐

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

Further R & D on graphite and Carbon composite materials within the 6th Framework partnership of Raphael-IP and Extremat-IP

Further R & D within the 6th Framework partnership of Raphael-IP

Further R & D within the 7th Framework Programme.

Collaborative development of HTR-10, PBMR

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

Raphael-IP partnership within Sub project on graphite materials

Extremat-IP partners interested in gas Cooled Fission Reactor Applications

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature :

Name: D. Buckthorpe

Date: 1st November 2004

Organisation: National Nuclear Corporation Limited

2.1 : Description of the result(s), one form per result**No. & TITLE OF RESULT** (same as in table 1.2)

No.	Self-descriptive title of the result
9	Summary Report of graphite material investigations for HTR

CONTACT PERSON FOR THIS RESULT

Name	Mr. Derek Buckthorpe
Position	Position
Organisation	National Nuclear Corporation Limited.
Address	Booths Hall, Chelford Road, Knutsford, Cheshire, UK
Telephone	00 44 (0)1565 84 3845
Fax	00 44 (0)1565 84 3878
E-mail	Derek.buckthorpe@nnc.co.uk
URL	
Specific Result URL	

SUMMARY (200 words maximum)

Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.

This reports the results of the graphite material investigations and covers a review and synthesis of the work on properties and oxidation.

The work will yield the following results:

- Review of past experience and data collection and insertion in a data-base for future use.
- Recommendations for feasibility, choice of graphite, and testing.
- Results of tests on selected graphites under irradiated conditions.
- Results of tests using the thermo-gravimetric facility THERA allowing more precise accident analyses with respect to corrosion
- Results of tests on advanced C-based materials (CFC's, doped materials, SiC) in the oxidation facility INDEX with respect to their oxidation resistance in steam and in air.

The results are provided in a Technical Report (se below) and as Deliverable 3.6 of the Project.

Please categorise the result using codes from Annex 1

Subject descriptors	373 Materials	531 Reactor	436 Nuc E & T	150 Data	373 Materials
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CURRENT STAGE OF DEVELOPMENT

Please tick one category only 

Scientific and/or Technical knowledge (Basic research)	☐ Y
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT

List main information and documentation, stating whether public or confidential.

Documentation type	Details (Title, ref. number, general description, language)	Status: <i>PU</i> =Public <i>CO</i> =Confidential
Technical Report	HTR-M 02/12 D 3 0 58 Summary Report - work performed on graphite within the HTR-M project	CO

INTELLECTUAL PROPERTY RIGHTS

<u>Type of IPR</u>	<u>KNOWLEDGE:</u> Tick a box and give the corresponding details (reference numbers, etc) if appropriate				<u>Pre-existing know-how</u> Tick a box and give the corresponding details(reference numbers, etc) if appropriate	
	Current				Foreseen	
	Tick	NoP ¹⁾	NoI ²⁾	Details	Tick	Details
Patent applied for	☐				☐	
Patent granted	☐				☐	
Patent search carried out	☐				☐	
Registered design	☐				☐	
Trademark applications	☐				☐	
Copyrights	☐				☐	
Secret know-how	☐				☐	
Other - please specify :	☐				☐	

1) Number of **P**riority (national) applications/patents

2) Number of **I**nternationally extended applications/patents

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	40				
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2.2. Quantified data about the result

Items (about the results)	Actual current quantity ^a	Estimated (or future) quantity ^b
Time to application / market (in months from the end of the research project)	immediate	Applicable to FP6 and beyond
Number of (public or private) entities potentially involved in the implementation of the result :	7 partners	21
of which : number of SMEs :	0	
of which : number of entities in third countries (outside EU) :	0	1
Targeted user audience: # of reachable people	20-100: HTR-TN & Eurocourse	Gen IV Members
# of S&T publications (referenced publications only)	1	
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	0	
# of publications addressing decision takers / public authorities / etc.	0	
Visibility for the general public	No	

^a Actual current quantity = the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.

2.3. Further collaboration, dissemination and use of the result

(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)

COLLABORATIONS SOUGHT

Please tick appropriate boxes (☐) corresponding to your needs.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ Y
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
			Other	(please specify)	☐

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

Further R & D on Graphite materials within the 6th Framework partnership of Raphael-IP and Extremat-IP

Further R & D within the 6th Framework partnership of Raphael-IP

Further R & D within the 7th Framework Programme.

Collaborative development of HTR-10, PBMR

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

Raphael-IP partnership within Sub project on Graphite materials

Extremat-IP partnership interested in Gas Cooled Fission Reactor Applications, graphite and C-based materials development

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature:

Name: D. Buckthorpe

Date: 1st November 2004

Organisation: National Nuclear Corporation Limited

2.1 : Description of the result(s), one form per result**No. & TITLE OF RESULT** (same as in table 1.2)

No.	Self-descriptive title of the result
10	Overall Summary Report of Project

CONTACT PERSON FOR THIS RESULT

Name	Mr. Derek Buckthorpe
Position	Senior Consultant Engineer
Organisation	National Nuclear Corporation Limited.
Address	Booths Hall, Chelford Road, Knutsford, Cheshire, UK
Telephone	00 44 (0)1565 84 3845
Fax	00 44 (0)1565 84 3878
E-mail	Derek.buckthorpe@nnc.co.uk
URL	
Specific Result URL	

SUMMARY (200 words maximum)

Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.

This project on materials for the HTR involves two main areas of activity: The first covering a literature review and data - base to establish a firm platform of information on which to assess the needs for future HTR's. The second covers materials testing including irradiation tests in the High Flux Reactor at Petten, Oxidation tests at FZJ, mechanical testing at CEA and JRC. The results of the HTR-M project are summarised in a Final Technical Report and presented at International Conferences.

Please categorise the result using codes from Annex 1

Subject descriptors	373 Materials	531 Reactor	436 Nuc E. & T	150 Data	373 Materials
----------------------------	----------------------	--------------------	-----------------------	-----------------	----------------------

CURRENT STAGE OF DEVELOPMENT

Please tick one category only 

Scientific and/or Technical knowledge (Basic research)	☐ Y
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT

List main information and documentation, stating whether public or confidential.

Documentation type	Details (Title, ref. number, general description, language)	Status: PU=Public CO=Confidential
Conference paper	HTR-M 01/5 D-0.0.6 Materials for the High Temperature Reactor, Smirt 16 paper No. 1941, Div S. Washington D.C. , U.S.A. Aug 2001 (English)	PU
Conference paper	HTR-M 01/10 D-0.0.16 Investigation of High Temperature Reactor (HTR) Materials (English)	PU
Conference (poster) paper	HTR-M 02/4 D-0.0.29 Materials for the High Temperature Reactor, HTR2002 Conference, Petten, 22-24 th April 2002 (English)	PU
Conference (poster) paper	HTR-M 02/4 D-0.0.30 High Temperature Reactor (HTR) Materials, Liege Conference, 30 th Sept. to 2 nd Oct., 2002 (English)	PU
Conference paper	HTR-M 02/11 D-0.0.46 European Project on Materials for Modular HTR's, ENC2002 Conference, Lille, France, 7-9 th October 2002	PU
Conference paper	HTR-M ¾ D 0 0 64 Research and Development Programme on HTR materials, paper 3174, ICAPP03 Conference, Cordoba, Spain, 4-7 th May, 2003	PU
Conference paper	HTR-M ¾ D 0 0 67 Progress on HTR-M projects for HTR, paper S443, 17 th SMIRT Conference, Prague, Czech Republic, 12-17 TH august 2003	PU
HTR Eurocourse	HTR-M ¾ D 0 0 68 HTR Materials & Technologies, Review of Metallic Materials used in HTR's – HTR Eurocourse, CEA, Cadarache, 4-8 th November 2002	CO
Conference paper	HTR-M 03/10 D 0 0 79 High Temperature Reactor Materials: Progress of HTR-M Projects, NEA/OECD, 3 rd Information Exchange Meeting on High Temperature Engineering, JEARI, Ibaraki-ken, Japan, 11-12 th September 2003	PU
Conference paper	HTR-M 04/9 D 0 0 96 Results from EU 5 th Framework HTR Projects –HTR-M & HTR-M1, paper E12, HTR2004 Conference, Beijing, China, 22-24 th September 2004	PU
Technical Report	HTR-M 04/12 P 0 0 105 Final Technical Report for the HTR-M Project	CO

INTELLECTUAL PROPERTY RIGHTS

<u>Type of IPR</u>	<u>KNOWLEDGE:</u> Tick a box and give the corresponding details (reference numbers, etc) if appropriate				<u>Pre-existing know-how</u> Tick a box and give the corresponding details(reference numbers, etc) if appropriate		
	Current				Foreseen	Tick	Details
	Tick	NoP ¹⁾	NoI ²⁾	Details	Tick		
Patent applied for	☐				☐	☐	
Patent granted	☐				☐	☐	
Patent search carried out	☐				☐	☐	
Registered design	☐				☐	☐	
Trademark applications	☐				☐	☐	
Copyrights	☐				☐	☐	
Secret know-how	☐				☐	☐	
Other - please specify :	☐				☐	☐	

1) Number of **P**riority (national) applications/patents

2) Number of **I**nternationally extended applications/patents

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	40				
----------------------------	----	--	--	--	--

2.2. Quantified data about the result

Items (about the results)	Actual current quantity ^a	Estimated (or future) quantity ^b
Time to application / market (in months from the end of the research project)	immediate	Applicable to FP6 and beyond
Number of (public or private) entities potentially involved in the implementation of the result :	7 partners	21
of which : number of SMEs :	0	
of which : number of entities in third countries (outside EU) :	0	1
Targeted user audience: # of reachable people	20-100: HTR-TN & Eurocourse	Gen IV Members
# of S&T publications (referenced publications only)	9	+3
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	0	
# of publications addressing decision takers / public authorities / etc.	0	
Visibility for the general public	No	

^a Actual current quantity = the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.

2.3. Further collaboration, dissemination and use of the result

(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)

COLLABORATIONS SOUGHT

Please tick appropriate boxes (☐) corresponding to your needs.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ Y
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
			Other	(please specify)	☐

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

Further R & D on Gas Cooled Reactor Technology and materials within the 6th Framework partnership of Raphael-IP and Extremat-IP

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

Raphael-IP partnership within Sub project on materials development

Extremat-IP Partnership interested in Gas Cooled Fission Reactors and materials for such applications

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature:

Name: D. Buckthorpe

Date: 1st November 2004

Organisation: National Nuclear Corporation

Part 3 Description of the intentions by each partner

This part 3 must be completed by each partner who is essential for the dissemination and use (i.e. result owners and/or major project contributors and/or major dissemination and use contributors). Each will detail its own use and dissemination intentions concerning the result(s) they are involved with. This description must be made result by result.

These different parts may be transmitted to the Commission either assembled at the consortium level, or individually by each partner to safeguard confidential matters if necessary (through any appropriate media). Obviously, when all partners are implementing a single dissemination and use scheme all together, a single part 3 is needed.

**PARTS 3 WILL ALWAYS BE KEPT CONFIDENTIAL BY THE
COMMISSION**

3.1 : Description of the use and the dissemination of result(s), partner per partner

MANDATORY INFORMATION :

CONTRACT NUMBER :

FIKS-CT2000-00032 & FIKS-CT2001- 135

PARTNER's NAME :

National Nuclear Corporation Limited

CONTACT PERSON(S):

Name	Mr. D. E. Buckthorpe
Position/Title	Senior Consultant Engineer
Organisation	Nataional Nuclear Corporation Limited
Address	Booths Hall, Chelford Road, Knutsford, Cheshire WA16 8QZ, United Kingdom
Telephone	44 1565 843845
Fax	44 1565 843878
E-mail	Derek.buckthorpe@nnc.co.uk

No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)

1	Review of vessel materials & establishing data base for HTR There is a substantial technology base from past and current thermal and high temperature reactors. Review of information on vessel materials was compiled and the feasibility of the different materials assessed against future requirements. Available experimental and related design information was assembled in a data base for future application. The NNC results were reported in 8 technical reports.
2	Vessel test results under irradiated and non irradiated conditions Information on and suitability of selected material for fabrication of typical HTR Pressure Vessel weld. Planning for experiments and assessment results from strength tests on welded material in the un-irradiated and irradiated condition. Derivation of the effect of irradiation. NNC provided 2 technical reports for this result.
3	Summary Report of vessel material investigations for HTR. Contribution to the main findings on outcome of the vessel materials work including applicability to future HTR's.
4	Review & data base for materials for the high temperature structures (internals & turbine) of HTR Review of performance of potential high temperature materials for HTR direct cycle application. Review of available information on carbon/ carbon composite materials for the control rod. Review of available information on potential materials for the turbine disc and blades. Available experimental and related design information to be assembled in a database for future application. The NNC results were reported in 4 technical reports.
5	Investigations and testing of materials for the high temperature structures (control rod & turbine (blades & disc)) of HTR. Information on and suitability of selected materials to be assessed from short and medium strength tests. Resulting experimental data to be incorporated in developing data base. Support to planning of tests and assessment of results with respect to suitability of material for application on direct cycle components.

6	Summary Report of high temperature ,material investigations for HTR Contribution to main findings on outcome of the high temperature materials work including applicability to future HTR's.
7	Review of graphite materials & data base / selection for HTR Graphites used on past gas cooled reactors are no longer available for use on future HTR's. Information with regard to irradiated properties of currently manufactured graphites is not available. A review of the information on past graphites nevertheless provides a significant starting point for future graphite development. A database of available information to be assembled as available for assessment of current graphites. NNC was the Work package Leader for this result. NNC provide 5 technical reports for this result.
8	Graphite test results for effects of oxidation Only a small number of irradiation programmes have been performed to determine behaviour of graphites at high temperatures. Tests to be performed by FZJ at temperature on current available graphites to improve information on oxidation models and carbon fibre composites(CFC's) needed for air ingress evaluation. Contribution to planning and assessment of results on parameters for kinematic models and oxidation behaviour in air and steam at high temperature for selected materials and assessed for HTR application. NNC was the Work Package Leader for this result.
9	Summary Report of graphite material investigations for HTR Contribution to main findings on outcome of the graphite materials work including applicability to future HTR's. NNC was the Workpackage Leader for this resuslt. NNC contributed 1 Technical Report for this result.
10	Short Overall Summary Report Main findings on outcome of the whole project with respect to materials requirements and availability for future HTR's. NNC contributed three Annual Technical Reports and the Final Report for this result. Also prepared and presented 9 Technical papers at International Conferences.

FOR EACH MAIN RESULT:**TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT**

<i>Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale</i>		
Activity	Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).	Timescale (months)
1	Public presentation of the outcome of the technology	24
2	Results to be used to future activities within HTR-TN on European HTR Development	12
3	Results to be used to support UK, European and International collaboration activities on advanced projects	12
4	Information and results to be used in other R & D projects and to underline future R & D activities.	24
5	Training in the technology within company and Eurocourse activities	6 th Framework

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (☐) corresponding to your most probable follow-up.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange, training	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
Other (please specify)					☐

3.2 : Quantified data for each partner's main result

Items	Currently achieved quantity ^a	Estimated future quantity ^b
Economic impacts (in EURO)	-	-
# of licenses issued (within EU)	-	-
# of licenses issued (outside EU)	-	-
Total value of licenses (in EURO)	-	-
# of entrepreneurial actions (start-up company, joint ventures...)	0	?
# of direct jobs created ^c	1	?
# of direct jobs safeguarded ^c	2	?
# of direct jobs lost	?	?

^a The added value or the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).

^c "Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation

= number of ...

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature:

Name: D.E.Buckthorpe

Date: 1ST November 2004

3.1 : Description of the use and the dissemination of result(s), partner per partner

MANDATORY INFORMATION :

CONTRACT NUMBER :

FIKS-CT2000-00032 & FIKS-CT2001- 135

PARTNER's NAME :

Framatome ANP

CONTACT PERSON(S):

Name	Mr Bernard Riou
Position/Title	Senior Engineer
Organisation	Framatome s.a.
Address	Direction Novatome 10 Rue Juliette- Recamier 69456 Lyon, Cedex 06 France
Telephone	33 4 7274 7360
Fax	33 4 7274 7325
E-mail	riou@framatome.fr

No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)

1	Review of vessel materials & establishing data base for HTR There is a substantial technology base from past and current thermal and high temperature reactors. Review of information on vessel materials to be compiled and the feasibility of the different materials assessed against future requirements. Framatome.ANP (France) contributed 2 Technical Reports towards this result.
2	Vessel test results under irradiated and non irradiated conditions Information on and suitability of selected material for fabrication of typical HTR Pressure Vessel weld. Contribution includes procurement of thick steel plate and fabrication of specific welded joints for tests at NRG and JRC. Assessment of results of strength tests in the un-irradiated and irradiated condition on welded material. Investigation of weld strength factors. Derivation of the effect of irradiation. Framatome.ANP (France) contributed 2 Technical Reports towards this result
3	Summary Report of vessel material investigations for HTR. Contribution to main findings on outcome of the vessel materials work including applicability to future HTR's.
4	Review & data base for materials for the high temperature structures (internals & turbine) of HTR Provision of design specification for control rod and turbine. Review of performance of potential high temperature materials for HTR direct cycle application. Review of available information on carbon/ carbon composite materials for the control rod. Review of available information on potential materials for the turbine disc and blades. Framatome.ANP (France) contributed 6 Technical Reports towards this result. .
5	Investigations and testing of materials for the high temperature structures (control rod & turbine (blades & disc)) of HTR. Information on and suitability of selected materials to be assessed from short and medium strength tests. Copntribution towards planning of experiments and assessment of results with respect to suitability of material for application on direct cycle components.

6	Summary Report of high temperature ,material investigations for HTR Contribution to main findings on outcome of the high temperature materials work including applicability to future HTR's.
7	Review of graphite materials & data base / selection for HTR Contribution to the Graphite review work.
8	Graphite test results for effects of irradiation & oxidation Contribution to the assessment of the Graphite test work
9	Summary Report of graphite material investigations for HTR Contribution to the conclusions on main findings on outcome of the graphite materials work including applicability to future HTR's
10	Short Overall Summary Report Contribution to the conclusions on main findings from the whole project with respect to materials requirements and availability for future HTR's.

FOR EACH MAIN RESULT:**TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT**

<i>Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale</i>		
Activity	Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).	Timescale (months)
1	Public presentation of the outcome of the technology	24
2	Results to be used to future activities within HTR-TN on European HTR Development	12
3	Results to be used to support UK, European and International collaboration activities on advanced projects	12
4	Information and results to be used in other R & D projects and to underline future R & D activities.	24
5	Training in the technology within company and Eurocourse activities	6 th Framework

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (☐) corresponding to your most probable follow-up.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐ ?	PPP	Private-public partnership	☐ ?
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange, training	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
Other (please specify)					☐

3.2 : Quantified data for each partner's main result

Items	Currently achieved quantity ^a	Estimated future quantity ^b
Economic impacts (in EURO)		
# of licenses issued (within EU)		
# of licenses issued (outside EU)		
Total value of licenses (in EURO)		
# of entrepreneurial actions (start-up company, joint ventures...)		
# of direct jobs created ^c		
# of direct jobs safeguarded ^c		
# of direct jobs lost		

^a The added value or the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).

^c "Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation

= number of ...

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature:

Name: B. Riou

Date: 1st November 2004

3.1 : Description of the use and the dissemination of result(s), partner per partner

MANDATORY INFORMATION :

CONTRACT NUMBER :

FIKS-CT2000-00032 & FIKS-CT2001- 135

PARTNER's NAME :

Commissariat a l' Energie Atomique (CEA)

CONTACT PERSON(S):

Name	Mr. Raphael Couturier
Position/Title	Senior Research Engineer
Organisation	Commissariat a l' Energie Atomique (CEA)
Address	CEREM DEM/SGM/L3M, CEA 38054 Grenoble, cedex 9, France
Telephone	33 4 7688 3559
Fax	33 4 7688 5891
E-mail	Couturier@chartreuse.cea.fr

No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)

1	Review of vessel materials & establishing data base for HTR Contribution to the technological review and data base work on vessel materials mainly in the area of evaluation needs for application, damage mechanisms and environment. CEA provided 3 Technical Reports towards this result.
2	Vessel test results under irradiated and non irradiated conditions Contribution to the planning of experiments and specification of test matrix for irradiated and non-irradiated tests on Mod 9Cr 1 Mo steel. Assessment of results against available results from CEA
3	Summary Report of vessel material investigations for HTR. Contribution towards the main findings/ outcome of the vessel materials work including applicability to future HTR's.
4	Review & data base for materials for the high temperature structures (internals & turbine) of HTR Review of performance of potential high temperature materials for HTR direct cycle application. Review of available information on carbon/ carbon composite materials for the control rod. Review of available information on potential materials for the turbine disc and blades. Available experimental and related design information to be assembled and main materials to be selected. CEA WAS THE work Package Leader for this result. CEA contributed 4 technical Deliverable towards this result.
5	Investigations and testing of materials for the high temperature structures (control rod & turbine (blades & disc)) of HTR. Information on and suitability of selected materials to be assessed from short and medium strength tests. Procurement of material for the Turbine disc. Perform experiments in air on disc and blade materials (project tests in this area to be shared with JRC). Data to be incorporated in developing database. Results to be assessed with respect to suitability of material for application on direct cycle components. CEA was the work package Leader for this result. CEA contributed 2 technical Deliverable towards this result.

6	Summary Report of high temperature ,material investigations for HTR Reporting of main findings on outcome of the high temperature materials work including applicability to future HTR's. CEA was the work Package Leader for this result. CEA contributed 2 Technical Reports towards this result.
7	Review of graphite materials & data base / selection for HTR Contribution towards the technological review of Graphite materials.
8	Graphite test results for effects of irradiation & oxidation Contribution towards the assessment of Graphite test work
9	Summary Report of graphite material investigations for HTR Contribution towards the conclusions on main findings of the graphite materials work including applicability to future HTR's
10	Overall Summary Report Contribution towards the conclusions/ main findings from the whole project with respect to materials requirements and availability for future HTR's.

FOR EACH MAIN RESULT:**TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT**

<i>Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale</i>		
Activity	Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).	Timescale (months)
1	Public presentation of the outcome of the technology	24
2	Results to be used to future activities within HTR-TN on European HTR Development	12
3	Results to be used to support UK, European and International collaboration activities on advanced projects	12
4	Information and results to be used in other R & D projects and to underline future R& D activities.	24
5	Training in the technology within company and Eurocourse activities	6 th Framework

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (☐) corresponding to your most probable follow-up.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ Y
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange, training	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
				Other (please specify)	☐

3.2 : Quantified data for each partner's main result

Items	Currently achieved quantity ^a	Estimated future quantity ^b
Economic impacts (in EURO)		
# of licenses issued (within EU)		
# of licenses issued (outside EU)		
Total value of licenses (in EURO)		
# of entrepreneurial actions (start-up company, joint ventures...)		
# of direct jobs created ^c		
# of direct jobs safeguarded ^c		
# of direct jobs lost		

^a The added value or the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).

^c "Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation

= number of ...

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature:

Name: R. Couturier

Date: 1st November 2004

3.1 : Description of the use and the dissemination of result(s), partner per partner

MANDATORY INFORMATION :

CONTRACT NUMBER :

FIKS-CT2000-00032 & FIKS-CT2001- 00135

PARTNER's NAME :

Nuclear Research and Consultancy Group (NRG, Petten)

CONTACT PERSON(S):

Name	B. van der Schaaf, J.B.J. Hegeman
Position/Title	Group-manager, Project leader
Organisation	NRG, Petten
Address	Westerduinweg 3, P.O. Box 25, 1755 ZG, Petten, The Netherlands
Telephone	+ 31 224 564246
Fax	+ 31 224 568886
E-mail	hegeman@nrg-nl.com

No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)

1	Review of vessel materials & establishing data base for HTR There is a substantial technology base from past and current thermal and high temperature reactors. Review of information on vessel materials to be compiled and the feasibility of the different materials assessed against future requirements. Available experimental and related design information to be assembled in a data base for future application. NRG was the WP leader for this result.
2	Vessel test results under irradiated and non irradiated conditions Information on and suitability of selected material for fabrication of typical HTR Pressure Vessel weld. NRG activities included experiments on irradiation of welded material in HFR plus strength tests in shielded facilities and derivation of results of strength tests in the un-irradiated and irradiated condition on welded material. Derivation of the effect of irradiation. NRG was the WP leader for this result. NRG Contributed 3 technical Reports towards this result.
3	Summary Report of vessel material investigations for HTR. NRG was the WP leader for this result. Provide the main findings on outcome of the vessel materials work including applicability to future HTR's. NRG contributed 1 Technical Reports towards this result.
10	Overall Summary Report Contribution towards the conclusions/ main findings from the whole project with respect to materials requirements and availability for future HTR's.

FOR EACH MAIN RESULT:**TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT**

<i>Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale</i>		
Activity	Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).	Timescale (months)
1	Use of the final database for design tasks in FP6	36
2	Final Report, baseline for project definition for FP6	12
3	Use of the final report for HTR related vessel design tasks by NRG	36
4	Design and Safety Report and analysis of the capsule will be used for irradiation and capsule improvements	36
5	Final PIE results will be used for external publication on seminar and/or conference	12
6	Specifications of the weldment and final report on reference testing will be used for T91 welding and comparison in future programmes	36

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (☐) corresponding to your most probable follow-up.

R&D	Further research or development	?	FIN	Financial support	?
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange, training	?
JV	Joint venture	?	CONS	Available for consultancy	?
			Other	(please specify)	☐

3.2 : Quantified data for each partner's main result

Items	Currently achieved quantity ^a	Estimated future quantity ^b
Economic impacts (in EURO)	-	-
# of licenses issued (within EU)	-	-
# of licenses issued (outside EU)	-	-
Total value of licenses (in EURO)	0	0
# of entrepreneurial actions (start-up company, joint ventures...)	0	2
# of direct jobs created ^c	?	?
# of direct jobs safeguarded ^c	?	?
# of direct jobs lost	?	2

^a The added value or the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).

^c "Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation

= number of ...

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature:

Name: B. van der Schaaf

Date: 1st November 2004

3.1 : Description of the use and the dissemination of result(s), partner per partner

MANDATORY INFORMATION :

CONTRACT NUMBER :

FIKS-CT2000-00032 & FIKS-CT2001- 135

PARTNER's NAME :

Joint Research Centre Directorate General - Institute of

CONTACT PERSON(S):

Name	Mr. Henrik Rantala
Position/Title	Senior Research Engineer
Organisation	Joint Research Centre Directorate General
Address	Institute for Energy P.O.Box 2 NL1755 ZG Petten, Westerduinweg 3 Netherlands
Telephone	31 224 56 53 06
Fax	31 224 56 1568
E-mail	rantala@jrc.nl

No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)

1	Review of vessel materials & establishing data base for HTR Contribution to the work on literature review and assessment of material for testing
2	Vessel test results under irradiated and non irradiated conditions Information on and suitability of selected material for fabrication of typical HTR Pressure Vessel weld. Carry out series of strength tests in the un-irradiated condition on welded material. Derivation of properties for assessment of the effect of irradiation. JRC was a joint author to 1 Technical Report towards this result.
3	Summary Report of vessel material investigations for HTR. Contribution to main findings on outcome of the vessel materials work including applicability to future HTR's.
4	Review & data base for materials for the high temperature structures (internals & turbine) of HTR Contribution to the technical review of turbine materials for identification of materials to be tested .
5	Investigations and testing of materials for the high temperature structures (control rod & turbine (blades & disc)) of HTR. Information on and suitability of selected materials to be assessed from short and medium strength tests. Procurement of material for the Turbine blades. Construction of corrosion facility. Perform experiments in simulated atmospheres on disc and blade materials (project tests in this area to be shared with CEA). Data to be incorporated in developing database. Results to assessed with respect to suitability of material for application on direct cycle components. JRC provided 1 Technical Report towards this result.

6	Summary Report of high temperature ,material investigations for HTR Contribution to main findings on outcome of the high temperature materials work including applicability to future HTR's
10	Short Overall Summary Report Contribution to main findings on outcome of the whole project with respect to materials requirements and availability for future HTR's.

FOR EACH MAIN RESULT:**TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT**

<i>Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale</i>		
Activity	Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).	Timescale (months)
1	Public presentation of the outcome of the technology	24
2	Results to be used to future activities within HTR-TN on European HTR Development	12
3	Results to be used to support UK, European and International collaboration activities on advanced projects	12
4	Information and results to be used in other R & D projects and to underline future R & D activities.	24
5	Training in the technology within company and Eurocourse activities	6 th Framework

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (☐) corresponding to your most probable follow-up.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐ ?
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange, training	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
Other (please specify)					☐

3.2 : Quantified data for each partner's main result

Items	Currently achieved quantity ^a	Estimated future quantity ^b
Economic impacts (in EURO)		
# of licenses issued (within EU)		
# of licenses issued (outside EU)		
Total value of licenses (in EURO)		
# of entrepreneurial actions (start-up company, joint ventures...)		
# of direct jobs created ^c		
# of direct jobs safeguarded ^c		
# of direct jobs lost		

^a The added value or the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).

^c "Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation

= number of ...

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature:

Name: H. Rantala

Date: 1st November 2004

3.1 : Description of the use and the dissemination of result(s), partner per partner

MANDATORY INFORMATION :

CONTRACT NUMBER :

FIKS-CT2000-00032 & FIKS-CT2001- 135

PARTNER's NAME :

Forschungszentrum Juelich GmbH (FZJ)

CONTACT PERSON(S):

Name	Kertsyn Kuehn
Position/Title	Senior Researcher
Organisation	Forschungszentrum Juelich GmbH
Address	ESS-Project 52425 Jülich Germany
Telephone	49 2461 61 4644
Fax	49 2461 61 8255
E-mail	k.kuehn@fz-juelich.de

No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)

1	Review of vessel materials & establishing data base for HTR Contribution to the review of vessel materials through experience at FZJ
2	Vessel test results under irradiated and non irradiated conditions Provide information on and suitability of selected material for fabrication of typical HTR Pressure Vessel weld. Support to assessment of results of strength tests in the un-irradiated and irradiated condition on welded material through experience at FZJ.
3	Summary Report of vessel material investigations for HTR. Contribution to the main findings on outcome of the vessel materials work including applicability to future HTR's.
4	Review & data base for materials for the high temperature structures (internals & turbine) of HTR Review of performance of potential high temperature materials for HTR direct cycle application. Review of available information on carbon/ carbon composite materials and information on potential materials for the turbine disc and blades. Provision of available experimental and related design information to be assembled in a data base for future application.. Support to high temperature materials through FZJ experience on nuclear and non-nuclear industrial applications. .
5	Investigations and testing of materials for the high temperature structures (control rod & turbine (blades & disc)) of HTR. Information on and suitability of selected materials to be assessed from short and medium strength tests. Advice/ experience regarding experiments and corrosion in helium environment. Resulting experimental data to be incorporated in developing data base. Results to be assessed with respect to suitability of material for application on direct cycle components.

6	Summary Report of high temperature ,material investigations for HTR Contribution to the main findings on outcome of the high temperature materials work including applicability to future HTR's.
7	Review of graphite materials & data base / selection for HTR Graphites used on past gas cooled reactors are no longer available for use on future HTR's. Information with regard to irradiated properties of currently manufactured graphites is not available. A review of the information on past graphites nevertheless provides a significant starting point for future graphite development. A database of available information to be assembled as available for assessment of current graphites. FZJ provided joint authorship of 1 technical report for this result.
8	Graphite test results for effects of irradiation & oxidation Only a small number of irradiation programmes have been performed to determine behaviour of graphites at high temperatures. Experimental tests performed at FZJ at temperature to improve information on oxidation models and carbon fibre composites(CFC's) needed for air ingress evaluation. Results on parameters for kinematic models and oxidation behaviour in air and steam at high temperature to be provided for selected materials and assessed for HTR application. FZJ provided 2 Technical Reports towards this result.
9	Summary Report of graphite material investigations for HTR Contribution to main findings on outcome of the graphite materials work including applicability to future HTR's.
10	Short Overall Summary Report Contribution to main findings on outcome of the whole project with respect to materials requirements and availability for future HTR's.

FOR EACH MAIN RESULT:**TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT**

<i>Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale</i>		
Activity	Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).	Timescale (months)
1	Public presentation of the outcome of the technology	24
2	Results to be used to future activities within HTR-TN on European HTR Development	12
3	Results to be used to support UK, European and International collaboration activities on advanced projects	12
4	Information and results to be used in other R & D projects and to underline future R & D activities.	24
5	Training in the technology within company and Eurocourse activities	6 th Framework

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (☐) corresponding to your most probable follow-up.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange, training	☐ Y
JV	Joint venture	☐	CONS	Available for consultancy	☐ Y
				Other (please specify)	☐

3.2 : Quantified data for each partner's main result

Items	Currently achieved quantity ^a	Estimated future quantity ^b
Economic impacts (in EURO)		
# of licenses issued (within EU)		
# of licenses issued (outside EU)		
Total value of licenses (in EURO)		
# of entrepreneurial actions (start-up company, joint ventures...)		
# of direct jobs created ^c		
# of direct jobs safeguarded ^c		
# of direct jobs lost		

^a The added value or the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).

^c "Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation

= number of ...

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature:

Name: K. Kuhn

Date: 1st November 2004

3.1 : Description of the use and the dissemination of result(s), partner per partner**MANDATORY INFORMATION :****CONTRACT NUMBER :****FIKS-CT2000-00032 & FIKS-CT2001-00135****PARTNER's NAME :****Empresarios Agrupados Internacional s.a. (E.A.S.A. MD)****CONTACT PERSON(S):**

Name	Mr. A. Buenaventura
Position/Title	Expert
Organisation	Empresarios Agrupados Internacional s.a. (E.A.S.A. MD)
Address	Spain
Telephone	34 91 309 8000
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E-mail	Faz@empre.es

No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)

1	Review of vessel materials & establishing data base for HTR Contribution the technical synthesis of information on vessel materials to be compiled and the feasibility of the different materials assessed against future requirements. EA provided 4 Technical Reports towards this result.
2	Vessel test results under irradiated and non irradiated conditions Provide information on and suitability of selected material for fabrication of typical HTR Pressure Vessel weld. Support to strength tests in the un-irradiated and irradiated condition on welded material.
3	Summary Report of vessel material investigations for HTR. Contribution to main findings on outcome of the vessel materials work including applicability to future HTR's.
4	Review & data base for materials for the high temperature structures (internals & turbine) of HTR Contribution towards the technical synthesis of potential high temperature materials for HTR direct cycle application. Review of available information on carbon/ carbon composite materials for the control rod. Review of available information on potential materials for the turbine disc and blades. Available experimental and related design information to be assembled in a database for future application. EA provided 1 technical report towards this result. .
5	Investigations and testing of materials for the high temperature structures (control rod & turbine (blades & disc)) of HTR. Contribution towards the planning of experiments and assessment of results form tests on selected materials. Results assessed with respect to suitability of material for application on direct cycle components.

6	Summary Report of high temperature ,material investigations for HTR Contribution to main findings on outcome of the high temperature materials work including applicability to future HTR's.
10	Short Overall Summary Report Contribution to main findings on outcome of the whole project with respect to materials requirements and availability for future HTR's.

FOR EACH MAIN RESULT:**TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT**

<i>Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale</i>		
Activity	Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).	Timescale (months)
1	Public presentation of the outcome of the technology	24
2	Results to be used to future activities within HTR-TN on European HTR Development	12
3	Results to be used to support UK, European and International collaboration activities on advanced projects	12
4	Information and results to be used in other R & D projects and to underline future R & D activities.	24
5	Training in the technology within company and Eurocourse activities	6 th Framework

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (☐) corresponding to your most probable follow-up.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange, training	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
Other (please specify)					☐

3.2 : Quantified data for each partner's main result

Items	Currently achieved quantity ^a	Estimated future quantity ^b
Economic impacts (in EURO)		
# of licenses issued (within EU)		
# of licenses issued (outside EU)		
Total value of licenses (in EURO)		
# of entrepreneurial actions (start-up company, joint ventures...)		
# of direct jobs created ^c		
# of direct jobs safeguarded ^c		
# of direct jobs lost		

^a The added value or the number of items already achieved to date.

^b Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).

^c "Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation

= number of ...

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature:

Name: A. Buenaventura

Date: 1st November 2004

3.1 : Description of the use and the dissemination of result(s), partner per partner

MANDATORY INFORMATION :

CONTRACT NUMBER :

FIKS-CT2000-00032 & FIKS-CT2001- 135

PARTNER's NAME :

Framatome ANP (GmbH)

CONTACT PERSON(S):

Name	Bernd-Christian Friedrich
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Telephone	49 9131 18 3839
Fax	49 9131 18 2911
E-mail	Bernd-Christian.Freidrich@erl11.siemens.de

No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)

1	Review of vessel materials & establishing data base for HTR Contribution to technical synthesis taking account of the substantial technology base from past and current thermal and high temperature reactors. Review of information on vessel materials and the feasibility of the different materials against future requirements. Available experimental and related design information to be assembled in a database for future application. Framatome.ANP (Germany) contributed 1 technical report towards this result.
2	Vessel test results under irradiated and non irradiated conditions Information on and suitability of selected material for fabrication of typical HTR Pressure Vessel weld. Contribution to planning of experimental tests and evaluation of results of strength tests in the un-irradiated and irradiated condition on welded material.
3	Summary Report of vessel material investigations for HTR. Contribution to main findings on outcome of the vessel materials work including applicability to future HTR's.
4	Review & data base for materials for the high temperature structures (internals & turbine) of HTR Contribution to technical Synthesis on potential high temperature materials for HTR direct cycle application. Review of available information on carbon/ carbon composite materials for the control rod. Review of available information on potential materials for the turbine disc and blades. Contribution towards provision of available experimental and related design information in a data base for future application.

5	Investigations and testing of materials for the high temperature structures (control rod & turbine (blades & disc)) of HTR. Contribution towards the planning of experiments and assessment of selected materials from short and medium strength tests. Contribution towards incorporation of experimental data in developing data base. Results to be assessed with respect to suitability of material for application on direct cycle components.
6	Summary Report of high temperature ,material investigations for HTR Contribution to main findings on outcome of the high temperature materials work including applicability to future HTR's.
10	Short Overall Summary Report Contribution to main findings on outcome of the whole project with respect to materials requirements and availability for future HTR's

FOR EACH MAIN RESULT:**TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT**

<i>Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale</i>		
Activity	Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).	Timescale (months)
1	Public presentation of the outcome of the technology	24
2	Results to be used to future activities within HTR-TN on European HTR Development	12
3	Results to be used to support UK, European and International collaboration activities on advanced projects	12
4	Information and results to be used in other R & D projects and to underline future R& D activities.	24
5	Training in the technology within company and Eurocourse activities	6 th Framework

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (☐) corresponding to your most probable follow-up.

R&D	Further research or development	☐ Y	FIN	Financial support	☐ Y
LIC	Licence agreement	☐	VC	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	PPP	Private-public partnership	☐
MKT	Marketing agreement/Franchising	☐	INFO	Information exchange, training	☐ Y
JV	Joint venture	☐ ?	CONS	Available for consultancy	☐ Y
Other (please specify)					☐

3.2 : Quantified data for each partner's main result

Items	Currently achieved quantity ^a	Estimated future quantity ^b
Economic impacts (in EURO)		
# of licenses issued (within EU)		
# of licenses issued (outside EU)		
Total value of licenses (in EURO)		
# of entrepreneurial actions (start-up company, joint ventures...)		
# of direct jobs created ^c		
# of direct jobs safeguarded ^c		
# of direct jobs lost		

^a The added value or the number of items already achieved to date.

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^c "Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation

= number of ...

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature:

Name: B-C Friedrich

Date: 1ST November 2004

ANNEX 1: SUBJECT DESCRIPTOR CODES

1	ACARIANS	67	BIOLOGICAL COLLECTIONS: MUSEA AND RELATED INFORMATION RESOURCES
2	ACCIDENTOLOGY	68	BIOLOGICAL ENGINEERING
3	ACCOUNTING	69	BIOLOGICAL MONITORING/RISK FACTORS AND ASSESSMENT
4	ACOUSTICS	70	BIOLOGICAL SCIENCES, BIOLOGY
5	ADMINISTRATIVE SCIENCES, ADMINISTRATION	71	BIOMASS PROCESS INTEGRATION AND ENVIRONMENTAL IMPACTS
6	ADULT EDUCATION, PERMANENT EDUCATION	72	BIOMECHANICS, BIOMEDICAL ENGINEERING
7	AERONAUTICS	73	BIOMEDICAL ETHICS
8	AGEING	74	BIOMEDICAL SCIENCES
9	AGRICULTURAL CHEMISTRY	75	BIOMOLECULES, BIOPLASTICS, BIOPOLYMERS
10	AGRICULTURAL ECONOMICS	76	BIOPHYSICS, MEDICAL PHYSICS
11	AGRICULTURAL ENGINEERING/TECHNOLOGY	77	BIOREACTORS
12	AGRICULTURAL MARKETING/TRADE	78	BIOREMEDIATION
13	AGRICULTURAL PRODUCTION SYSTEMS	79	BIOSAFETY
14	AGRICULTURAL SCIENCES, AGRICULTURE	80	BIOSENSORS
15	AGRI-FOOD, AGRI-ENVIRONMENT	81	BIOTECHNOLOGY, BIOENGINEERING
16	AGRONOMY	82	BIOTRANSFORMATION
17	AIR TRAFFIC CONTROL OPERATIONS/PROCEDURES/SLOT ALLOCATION	83	BOREAL FOREST
18	AIR TRAFFIC MANAGEMENT/FLOW MANAGEMENT	84	BRAIN DEVELOPMENT
19	AIR TRANSPORT TECHNOLOGY	85	BRAIN THEORY, BRAIN MAPPING
20	AIRCRAFT	86	BROADBAND TECHNOLOGIES
21	AIRPORT OPERATIONS/PROCEDURES	87	BROADCASTING
22	ALGAE	88	BROKERAGE SERVICES
23	ALGEBRA	89	BUILDING CONSTRUCTION, SHELL SUSTAINABILITY
24	ALGEBRAIC TOPOLOGY	90	BUSINESS COMMUNICATION
25	ALGORITHMS AND COMPLEXITY	91	BUSINESS ECONOMICS/STUDIES, ORGANISATION AND PROCESSES
26	ALLERGOLOGY	92	CARBOCHEMISTRY, PETROCHEMISTRY, FUELS AND EXPLOSIVES TECHNOLOGY
27	ALTERNATIVE PROPULSION SYSTEMS	93	CARBOHYDRATES AND OTHER MACROMOLECULES METABOLISM
28	ANALYTICAL CHEMISTRY	94	CARBON DIOXIDE CAPTURE/STORAGE/DISPOSAL
29	ANIMAL BANKS AND REPOSITORIES	95	CARDIOVASCULAR SYSTEM
30	ANIMAL BIOTECHNOLOGY	96	CARE AND HEALTH SERVICES, HELP TO THE HANDICAPPED
31	ANIMAL BREEDING/REPRODUCTION/NUTRITION	97	CELL COMMUNICATION
32	ANIMAL FEED, ANIMAL PRODUCTION	98	CENTRAL AND EASTERN EUROPEAN COUNTRIES
33	ANIMAL HEALTH, ANIMAL WELFARE	99	CERAMIC MATERIALS AND POWDERS
34	ANIMAL PARASITIC DISEASES	100	CERTIFICATION
35	ANIMAL PHYSIOLOGY	101	CHEMICAL METROLOGY
36	ANIMAL PRODUCTS	102	CHEMICAL TECHNOLOGY AND ENGINEERING
37	ANTHROPOGENIC IMPACT ON ECOSYSTEMS	103	CHEMISTRY/HOMOGENEOUS AND HETEROGENEOUS CATALYSIS/THEORETICAL/NANOCHEMISTRY
38	ANTHROPOLOGY	104	CHRONOLOGY, DATATION TECHNOLOGY
39	ANTIBIOTICS	105	CIVIL ENGINEERING (INCL PAVEMENTS AND STRUCTURES)
40	ANTICANCER THERAPIES	106	CLINICAL GENETICS, BIOLOGY
41	ANTI-FRAUD	107	CLINICAL PHYSICS, RADIOLOGY, TOMOGRAPHY, MEDICAL INSTRUMENTATION, MEDICAL IMAGING
42	APPLIED MATHEMATICS	108	CLINICAL RESEARCH, CLINICAL TRIALS, COMPUTERISED CLINICAL SYSTEMS
43	APPLIED PHYSICS	109	COAL MINING TECHNOLOGIES
44	AQUACULTURE, AQUACULTURE TECHNOLOGY	110	COASTAL MORPHOLOGICAL CHANGES AND COASTAL DEFENSE MECHANISMS
45	ARCHIVISTICS/DOCUMENTATION/TECHNICAL DOCUMENTATION	111	COASTAL ZONE ECOSYSTEMS AND MANAGEMENT
46	ARCTIC ENVIRONMENT	112	COATS AND SURFACE TREATMENT
47	ARTIFICIAL INTELLIGENCE	113	COGNITIVE SCIENCE
48	ARTS	114	COLLOIDS
49	ASSESSMENT AND MANAGEMENT OF LIVING RESOURCES	115	COMBINATORIAL CHEMISTRY
50	ASTRONOMY	116	COMBINED HEAT AND POWER SYSTEMS
51	ASTROPHYSICS/PLANETARY GEOLOGY	117	COMBUSTION BASICS AND EFFICIENCY
52	ATOMIC AND MOLECULAR PHYSICS	118	COMMERCIAL AND INDUSTRIAL ECONOMICS
53	AUDIOVISUAL COMMUNICATION	119	COMMON AGRICULTURAL POLICY
54	AUTOMATION, ROBOTIC CONTROL SYSTEMS	120	COMMUNICATION ENGINEERING/TECHNOLOGY
55	BACTERIOLOGY	121	COMMUNICATION SCIENCES/HUMAN COMPUTER INTERACTIONS
56	BANKING	122	COMMUNITY DEVELOPMENT, COMMUNITY STUDIES
57	BENCHMARKING TECHNIQUES		
58	BIOASSAYS		
59	BIOCATALYSTS		
60	BIOCHEMICAL TECHNOLOGY		
61	BIOCHEMISTRY, METABOLISM		
62	BIOCOMPUTING, MEDICAL INFORMATICS, BIOMATHEMATICS, BIOMETRICS		
63	BIODEGRADATION		
64	BIODIVERSITY		
65	BIOFERTILIZERS		
66	BIOGAS PRODUCTION		

123	COMPANY RE-ENGINEERING/ORGANISATIONAL DEVELOPMENT	178	ECONOMICS IN AGRICULTURE/FORESTRY/RURAL DEVELOPMENT
124	COMPOSITE MATERIALS	179	ECONOMICS OF DEVELOPMENT/GROWTH/INNOVATION
125	COMPUTATIONAL BIOLOGY	180	ECONOMICS, ECONOMIC PLANNING
126	COMPUTATIONAL CHEMISTRY AND MODELING	181	ECOSYSTEM RESEARCH AND CONSERVATION
127	COMPUTATIONAL MATHEMATICS/DISCRETE MATHEMATICS	182	ECOTOXICOLOGY
128	COMPUTATIONAL PHYSICS	183	EDUCATION AND TRAINING, LIFELONG LEARNING, REMOTE LEARNING
129	COMPUTER SCIENCE/ENGINEERING, NUMERICAL ANALYSIS, SYSTEMS, CONTROL	184	EDUCATIONAL MULTIMEDIA
130	COMPUTER TECHNOLOGY/GRAPHICS, META COMPUTING	185	EDUCATIONAL SCIENCES
131	COMPUTER-BASED TRAINING	186	ELECTRICAL ENGINEERING/TECHNOLOGY
132	CONDENSED MATTER: ELECTRONIC, MAGNETIC AND SUPERCONDUCTIVE PROPERTIES	187	ELECTROMAGNETISM
133	CONDENSED MATTER: MECHANICAL AND THERMAL PROPERTIES	188	ELECTRONIC COMMERCE, ELECTRONIC PAYMENT, ELECTRONIC SIGNATURE
134	CONDENSED MATTER: OPTICAL AND DIELECTRIC PROPERTIES	189	ELECTRONIC DATA INTERCHANGE
135	CONDENSED MATTER: SOFT MATTER AND POLYMER PHYSICS	190	ELECTRONIC HEALTH RECORDS
136	CONSUMER SCIENCES, CONSUMERS' RIGHTS	191	ELECTRONIC PUBLISHING, AUTHORING TOOLS
137	CONTROL ENGINEERING	192	ELECTRONICS, ELECTRONIC ENGINEERING
138	COOPERATIVE WORKING	193	EMERGENCY MANAGEMENT
139	CORROSION	194	EMISSION
140	COSMOLOGY	195	EMPLOYMENT STUDIES
141	CRIMINOLOGY	196	ENDOCRINOLOGY, SECRETING SYSTEMS, DIABETOLOGY
142	CROP, CROP INPUTS/MANAGEMENT/YIELD ESTIMATION	197	ENERGY AND CLIMATE CHANGE
143	CULTURAL HERITAGE: PRESERVATION AND RESTORATION/CULTURAL STUDIES	198	ENERGY CONVERSION PROCESSES OR CYCLES/CONVERSION FROM COAL
144	CULTURE COLLECTIONS: MICROBIAL, CELL, TISSUE, GERMLASM	199	ENERGY MANAGEMENT SYSTEM
145	CURRICULUM STUDIES	200	ENERGY MARKET ANALYSIS
146	CYBERNETICS	201	ENERGY PRODUCTION FROM BIOMASS / WASTE
147	CYTOGENETICS	202	ENERGY RESEARCH/RTD POLICY
148	CYTOLOGY, CANCEROLOGY, ONCOLOGY	203	ENERGY, RENEWABLE ENERGIES, ELECTRICITY STORAGE
149	DATA PROTECTION, STORAGE TECHNOLOGY, CRYPTOGRAPHY	204	ENGINEERING, CONCURRENT ENGINEERING
150	DATABASES, DATABASE MANAGEMENT, DATA MINING	205	ENTOMOLOGY, PLANT PARASITOLOGY
151	DECENTRALISED GENERATION OF ELECTRICITY/HEAT	206	ENTREPRENEURSHIP, SPIN OFFS, NEW TECHNOLOGY BASED BUSINESS
152	DECISION SUPPORT TOOLS	207	ENVIRONMENT, ENVIRONMENTAL SCIENCE
153	DEEP WATER EXPLOITATION	208	ENVIRONMENTAL ECONOMICS/NATURAL RESOURCES ECONOMICS
154	DEMOGRAPHY	209	ENVIRONMENTAL HEALTH
155	DESIGN, DESIGN ENGINEERING	210	ENVIRONMENTAL IMPACTS/INTERACTIONS
156	DEVELOPMENT OF CLEAN FUELS FOR TRANSPORT	211	ENVIRONMENTAL INDICATORS/MONITORING/RISK ASSESSMENT
157	DEVELOPMENT POLICIES AND STUDIES	212	ENVIRONMENTAL LAW/TREATIES/POLICY
158	DEVELOPMENT TECHNOLOGY, ANIMAL GROWTH, ONTOLOGY, EMBRYOLOGY	213	ENVIRONMENTAL TECHNOLOGY/ENGINEERING, POLLUTION CONTROL
159	DIAGNOSTICS, DIAGNOSIS	214	EPIDEMIOLOGY
160	DIGITAL SYSTEMS, DIGITAL REPRESENTATION	215	ERGONOMICS
161	DISABILITIES, HANDICAPS AND HANDICAPPED	216	EROSION
162	DISEASES: RARE/CHRONIC/DEGENERATIVE, ETIOLOGIC FACTORS	217	EUROPEAN INTEGRATION
163	DIVERSIFICATION IN AGRICULTURE/FORESTRY	218	EUROPEAN LAW
164	DNA CHIP	219	EUROPEAN STUDIES
165	DNA THERAPIES	220	EVALUATION
166	DOWNSTREAM PROCESSING	221	EXPLOITATION OF RESEARCH RESULTS
167	"DRILLING TECHNOLOGY; DEEP DRILLING"	222	EXTENSIFICATION
168	DRUG ABUSE, ADDICTION	223	EXTERNALITIES
169	DRUG DISCOVERY, PROFILING, TARGETING	224	FARMHOUSE CONSTRUCTION
170	DRYLAND AND ARID ZONE ECOSYSTEMS	225	FARMING SYSTEMS
171	EARTH OBSERVATION APPLICATIONS AND POLICY	226	FERMENTATION
172	EARTH OBSERVATION TECHNOLOGY AND INFORMATION EXTRACTION	227	FINANCIAL SCIENCE, FINANCE
173	EARTH SCIENCE, EARTH OBSERVATION/STRATIGRAPHY/SEDIMENTARY PROCESSES	228	FINE CHEMICALS, DYES AND INKS
174	EARTH SCIENCES FOR CLIMATE RESEARCH	229	FISH/FISHERIES
175	ECOLOGY, ECOSYSTEMS, ECOLOGICAL EVOLUTION/DYNAMICS	230	FISHING METHODOLOGIES/SELECTIVITY
176	ECONOMIC AND ENVIRONMENT IMPACTS	231	FOOD AND DRINK TECHNOLOGY
177	ECONOMIC AND SOCIAL SCIENCES	232	FOOD CHEMISTRY, FOOD INGREDIENTS
		233	FOOD MICROBIOLOGY
		234	FOOD PROCESSING/PACKAGING
		235	FOOD QUALITY MANAGEMENT/POLICY/LABELLING
		236	FOOD TOXICOLOGY
		237	FOREST ECOSYSTEMS
		238	FOREST GENETICS
		239	FOREST PHYSIOLOGY AND PATHOLOGY
		240	FOREST POLICY, FOREST MANAGEMENT

241	FOREST PROTECTION	306	HYDROELECTRICITY/SMALL HYDRO/HYDROPOWER
242	FOREST SCIENCES	307	HYDROGEN
243	FORMAL SAFETY AND ENVIRONMENTAL ASSESSMENT	308	HYDROGEOLOGY, GEOGRAPHICAL AND GEOLOGICAL ENGINEERING
244	FREIGHT TRANSPORT	309	IDENTIFICATION SYSTEMS
245	FUEL CELLS	310	IMAGING, IMAGE PROCESSING
246	FUELS: ALTERNATIVE FUELS IN TRANSPORTS	311	IMMUNOLOGY, IMMUNOTHERAPY, IMMUNOASSAYS
247	FUNCTIONAL FOODS	312	IN VITRO TESTING/TRIAL METHODS
248	FUNGI	313	INDUSTRIAL ENGINEERING
249	FUTURE AND EMERGING TECHNOLOGIES	314	INDUSTRIAL POLICY/RELATIONS
250	GAS CONVERSION	315	INDUSTRIAL PSYCHOLOGY/SOCIOLOGY
251	GAS TURBINES FOR ENERGY CONVERSION	316	INDUSTRIAL TECHNOLOGY/ECONOMICS
252	GASES, FLUID DYNAMICS, PLASMAS/ELECTRIC DISCHARGES	317	INFECTIONS
253	GASTRO-ENTEROLOGY	318	INFORMATICS
254	GENDER ISSUES, GENDER STUDIES	319	INFORMATICS LAW
255	GENE THERAPY	320	INFORMATION MANAGEMENT
256	GENERAL PATHOLOGY, PATHOLOGICAL ANATOMY	321	INFORMATION TECHNOLOGY/SCIENCE
257	GENETIC COMPARATIVE ANALYSIS	322	INFRASTRUCTURE MANAGEMENT
258	GENETIC ENGINEERING	323	INLAND NAVIGATION
259	GENETIC MAPPING, GENE SEQUENCE	324	INNOVATION ASSISTANCE
260	GENETIC RESISTANCE	325	INNOVATION FINANCE
261	GENETIC SELECTION	326	INNOVATION MONITORING
262	GENETICALLY MODIFIED ORGANISMS	327	INNOVATION POLICY/STUDIES
263	GENETICS	328	INNOVATION TRAINING
264	GENOMES, GENOMICS	329	INORGANIC CHEMISTRY
265	GEOGRAPHIC INFORMATION SYSTEMS	330	INSECTS
266	GEOGRAPHY	331	INSTRUMENTATION TECHNOLOGY
267	GEOLOGICAL ENGINEERING/GEOTECHNICS	332	INTANGIBLE INVESTMENTS
268	GEOMETRY/TOPOLOGY	333	INTEGRATED ENVIRONMENTAL ASSESSMENT
269	GEOPHYSICS, PHYSICAL OCEANOGRAPHY, METEOROLOGY, GEOCHEMISTRY, TECTONICS	334	INTEGRATED GLOBAL SAFETY
270	GERONTOLOGY AND GERIATRICS	335	INTEGRATION OF RENEWABLE ENERGY SYSTEMS
271	GLOBAL CHANGE: BIOGEOCHEMICAL AND HYDROLOGICAL CYCLES	336	INTELLECTUAL PROPERTY
272	GLOBAL CHANGE: CLIMATE CHANGE	337	INTELLIGENT AGENTS
273	GLOBAL CHANGE: HUMAN HEALTH	338	INTELLIGENT VEHICLES AND WATERBORNE TRANSPORT SYSTEMS
274	GLOBAL CHANGE: LAND COVER AND DEGRADATION	339	INTERMODAL TRANSPORT
275	GLOBAL CHANGE: OZONE AND ATMOSPHERIC COMPOSITION	340	INTERNATIONAL COMMERCE/ECONOMICS
276	GLOBAL CYCLES OF ENERGY AND MATTER	341	INTERNATIONAL TREATIES / MULTILATERAL AGREEMENTS
277	GREEN TECHNOLOGIES/CHEMICALS	342	INTERNET TECHNOLOGIES
278	GRID CONNECTION	343	INVERTEBRATES
279	HAZARDS: INDUSTRIAL	344	JOURNALISM
280	HAZARDS: NATURAL	345	KNOWLEDGE ENGINEERING
281	HEALTH AND POPULATION, HEALTH EDUCATION	346	LABOUR MARKET STUDIES/ECONOMICS
282	HEALTH FINANCING / ECONOMICS	347	LAND USE PLANNING/LANDSCAPE/LANDSCAPE ARCHITECTURE
283	HEALTH RISK EVALUATION	348	LANGUAGE SCIENCES/ENGINEERING/TECHNOLOGY, LINGUISTICS
284	HEALTH SCIENCES/POLICIES/LAW	349	LARGE SCALE GENERATION OF ELECTRICITY/HEAT
285	HEALTH SERVICE MANAGEMENT	350	LASER TECHNOLOGY
286	HEALTH SYSTEMS RESEARCH	351	LAW: INTERNATIONAL / PRIVATE / PUBLIC
287	HEALTH, HEALTH PHYSICS	352	LEARNING MECHANISMS
288	HETEROGENEOUS CATALYSIS	353	LIBRARY SCIENCE/SYSTEMS
289	HIGH CONTAINMENT, HIGH CONTAINMENT FACILITIES	354	LIFE CYCLE MANAGEMENT
290	HIGH FREQUENCY TECHNOLOGY, MICROWAVES	355	LIPIDS, STEROIDS, MEMBRANES
291	HIGH-THROUGHPUT SCREENING	356	LIQUID BIOFUELS
292	HISTOLOGY, CYTOCHEMISTRY, HISTOCHEMISTRY, TISSUE CULTURE	357	LOGISTICS
293	HISTORY	358	LOW INPUT PRODUCTION
294	HISTORY AND PHILOSOPHY OF SCIENCE AND MEDICINE	359	MACROECONOMICS (INCL. MONETARY ECONOMICS)
295	HOME SYSTEMS	360	MACROMOLECULAR CHEMISTRY/NEW MATERIAL/SUPRAMOLECULAR STRUCTURES
296	HORMONES	361	MACROSOCIOLOGY
297	HORTICULTURE, ORNAMENTAL PLANTS	362	MAINTENANCE MANAGEMENT
298	HUMAN FACTORS IN TRANSPORT	363	MANAGEMENT OF ENTERPRISES
299	HUMAN GENETICS	364	MANAGEMENT OF URBAN AREAS
300	HUMAN RIGHTS	365	MANAGEMENT STUDIES
301	HUMAN SCIENCES, HUMANITIES	366	MARINE ECOSYSTEMS
302	HVAC SYSTEMS AND MANAGEMENT	367	MARINE SCIENCES/MARITIME STUDIES
303	HYBRID AND ELECTRIC VEHICLES	368	MARINE: INSTRUMENTATION AND UNDERWATER TECHNOLOGY
304	HYDROBIOLOGY, MARINE BIOLOGY, AQUATIC ECOLOGY, LIMNOLOGY	369	MARINE: OCEANOGRAPHY (PHYSICAL AND OPERATIONAL)
305	HYDROCARBONS EXPLORATION AND PRODUCTION	370	MARITIME SAFETY

371	MARKET ANALYSIS/ECONOMICS/QUANTITATIVE METHODS	437	NUCLEAR MEDICINE, RADIOBIOLOGY
372	MARKET STUDY, MARKETING	438	NUCLEAR PHYSICS
373	MATERIALS TECHNOLOGY/ENGINEERING	439	NUCLEIC ACID METABOLISM
374	MATHEMATICAL ANALYSIS/PARTIAL DIFFERENTIAL EQUATIONS	440	NUCLEIC ACIDS, POLYNUCLEOTIDES, PROTEIN SYNTHESIS
375	MATHEMATICAL LOGIC: SET THEORY, COMBINATORICS/SEMANTICS	441	NUMBER THEORY, FIELD THEORY, ALGEBRAIC GEOMETRY, GROUP THEORY
376	MATHEMATICAL PHYSICS	442	NUTRITION
377	MATHEMATICS	443	OBSERVATION SYSTEMS / CAPACITY / DATASETS / INDICATORS
378	MECHANICAL ENGINEERING, HYDRAULICS, VIBRATION AND ACOUSTIC ENGINEERING	444	OCCUPATIONAL HEALTH, INDUSTRIAL MEDICINE
379	MEDIA STUDIES/LAW/MASS COMMUNICATIONS	445	OCEAN / ENERGY
380	MEDICAL ANTHROPOLOGY	446	ODONTOLOGY, STOMATOLOGY
381	MEDICAL SCIENCES/RESEARCH	447	OFFSHORE TECHNOLOGY, SOIL MECHANICS, HYDRAULIC ENGINEERING
382	MEDICAL TECHNOLOGY	448	ON-LINE INFORMATION SERVICES, ON-LINE DEMOCRACY, ON-LINE BUSINESS
383	MEDICINAL CHEMISTRY	449	OPERATIONS RESEARCH, ACTUARIAL MATHEMATICS
384	MEDICINE (HUMAN AND VERTEBRATES)	450	OPTICAL MATERIALS
385	MEMBRANE TECHNOLOGY	451	OPTICS
386	MENTAL STRESS	452	OPTRONICS
387	METABOLIC REGULATION AND SIGNAL TRANSDUCTION	453	ORGANIC CHEMISTRY
388	METAL TECHNOLOGY AND METAL PRODUCTS	454	ORGANIC FARMING
389	METALLURGY	455	ORGANIC WASTE
390	METROLOGY, PHYSICAL INSTRUMENTATION	456	ORGANOMETALLIC CHEMISTRY
391	MICROBIAL BIOTECHNOLOGY, MICROBIAL MODELLING	457	ORPHAN DRUGS
392	MICROBIAL SYSTEMATICS/DIVERSITY	458	OTHER RENEWABLE ENERGY OPTIONS
393	MICROBIOLOGY	459	OTORHINOLARYNGOLOGY, AUDIOLOGY, AUDITIVE SYSTEM AND SPEECH
394	MICROECONOMICS (THEORETICAL AND APPLIED)	460	PALEOCLIMATOLOGY
395	MICROELECTRONICS	461	PALEONTOLOGY/PALEOECOLOGY
396	MICROENGINEERING, MICROMACHINING	462	PAPER TECHNOLOGY, RECYCLING
397	MICROSYSTEMS	463	PARASITOLOGY (HUMAN AND ANIMAL)
398	MINING	464	PARTICLE PHYSICS/FIELDS THEORY
399	MOBILE COMMUNICATIONS	465	PASSENGER TRANSPORT
400	MODELLING/MODELLING TOOLS, 3-D MODELLING	466	PATENTS, COPYRIGHTS, TRADEMARKS
401	MOLECULAR BIOLOGY	467	PATHOLOGY
402	MOLECULAR BIOPHYSICS	468	PATHOPHYSIOLOGY
403	MOLECULAR DESIGN, DE NOVO DESIGN	469	PERIPHERALS TECHNOLOGIES (MASS DATA STORAGE, DISPLAY TECHNOLOGIES)
404	MOLECULAR EVOLUTION	470	PERI-URBAN AGRICULTURE
405	MOLECULAR GENETICS	471	PESTICIDES, BIOPESTICIDES
406	MOLECULAR MARKERS AND RECOGNITION	472	PETROCHEMISTRY, PETROLEUM ENGINEERING
407	MONOCLONAL ANTIBODIES	473	PETROLOGY, MINERALOGY, GEOCHEMISTRY
408	MOTHER AND CHILD HEALTH	474	PHARMACEUTICALS AND RELATED TECHNOLOGIES
409	MOTORS AND PROPULSION SYSTEMS	475	PHARMACOLOGICAL SCIENCES, PHARMACOGNOSY, TOXICOLOGY
410	MOUNTAIN AND HIGHLAND ECOSYSTEMS	476	PHOTONIC NETWORKS
411	MULTIMEDIA	477	PHOTOVOLTAIC SYSTEMS, CELLS AND MODULES MANUFACTURING, TECHNOLOGY DEVELOPMENT
412	MULTISENSORY TECHNOLOGY, MULTI-SENSING	478	PHYSICAL CHEMISTRY/SOFT MATTER
413	MUSEUM SCIENCE	479	PHYSICAL GEOGRAPHY, CARTOGRAPHY, CLIMATOLOGY
414	MYCOLOGY	480	PHYSICAL MEDICINE, KINESITHERAPY, REVALIDATION, REHABILITATION
415	NANOBIOTECHNOLOGY	481	PHYSICAL SCIENCES
416	NANOFABRICATION, NANOTECHNOLOGY	482	PHYSICAL STRESS
417	NARROW BAND TECHNOLOGIES	483	PHYSICS OF FLUIDS
418	NATURAL GAS	484	PHYSIOLOGICAL DISORDERS
419	NATURAL HISTORY OF DISEASES	485	PHYSIOLOGY
420	NATURAL OILS, FATS AND WAXES	486	PHYTOREMEDIATION
421	NATURAL RESOURCES EXPLORATION	487	PHYTOTECHNOLOGY, PHYTOPATHOLOGY, CROP PROTECTION
422	NATURAL SCIENCES	488	PIPELINE TECHNOLOGY
423	NEMATODS	489	PLANT AND ASSOCIATED MICROORGANISM BIOTECHNOLOGY
424	NETWORK TECHNOLOGY, NETWORK SECURITY	490	PLANT BIOCHEMISTRY
425	NETWORKED ORGANISATIONS	491	PLANT BIOLOGY
426	NEUROBIOLOGY, NEUROCHEMISTRY, NEUROLOGY, NEUROPSYCHOLOGY, NEUROPHYSIOLOGY	492	PLANT GENETICS/SELECTION/BREEDING
427	NEUROINFORMATICS	493	PLANT HEALTH/PROTECTION
428	NEUTRON PHYSICS	494	PLANT INPUTS/NUTRITION/PRODUCTION
429	NEW MEANS OF TRANSPORT	495	PLANT PHYSIOLOGY
430	NITROGEN FIXATION	496	PLANT PRODUCTS
431	NOISE AND VIBRATIONS		
432	NON-COMMUNICABLE DISEASES		
433	NON-LINEAR DYNAMICS AND CHAOS THEORY		
434	NON-METALLIC MINERAL TECHNOLOGY		
435	NUCLEAR CHEMISTRY		
436	NUCLEAR ENGINEERING AND TECHNOLOGY		

497	POLITICAL SCIENCES/THEORY/ECONOMY/COMPARATIVE POLITICS	564	SILVICULTURE, FORESTRY, FOREST TECHNOLOGY
498	POLYMER TECHNOLOGY, BIOPOLYMERS	565	SIMULATION, SIMULATION ENGINEERING
499	POPULATION GENETICS	566	SIMULATOR TRAINING
500	PORT MANAGEMENT	567	SKELETON, MUSCLE SYSTEM, RHEUMATOLOGY, LOCOMOTION
501	POSITIONING AND GUIDANCE SYSTEMS	568	SMART CARDS
502	POST HARVEST TREATMENT - FOOD	569	SOCIAL ECONOMICS
503	POST HARVEST TREATMENT - NON-FOOD	570	SOCIAL LAW
504	PRECISION ENGINEERING	571	SOCIAL MEDICINE
505	PRION DISEASES	572	SOCIAL SHAPING OF TECHNOLOGY
506	PROBABILITY THEORY	573	SOCIETAL BEHAVIOUR
507	PROCESS EFFICIENCY	574	SOCIO-ECONOMIC ASPECTS OF ENVIRONMENTAL CHANGE
508	PROCESS ENGINEERING	575	SOCIO-ECONOMIC RESEARCH
509	PRODUCTION TECHNOLOGY	576	SOCIO-ECONOMICAL IMPACTS IN AGRICULTURE/FORESTRY/RURAL DEVELOPMENT
510	PROGRAMMING/INFORMATION SYSTEMS	577	SOCIO-ECONOMICS
511	PROJECT ENGINEERING	578	SOCIOLOGY
512	PROTEINS, ENZYMOLOGY, PROTEIN ENGINEERING	579	SOFTWARE ENGINEERING, MIDDLEWARE, GROUPWARE
513	PROTEOMES, PROTEOMICS	580	SOIL SCIENCE, AGRICULTURAL HYDROLOGY, WATER PROCESSES
514	PSYCHIATRY, MEDICAL PSYCHOLOGY, PSYCHOSOMATICS	581	SOLAR CONCENTRATING TECHNOLOGIES AND APPLICATIONS
515	PSYCHOLOGICAL SCIENCES, PSYCHOLOGY	582	SOLID STATE PHYSICS
516	PUBLIC ADMINISTRATION	583	SOUND ENGINEERING/TECHNOLOGY
517	PUBLIC HEALTH	584	SPACE TECHNOLOGY
518	PUBLIC PERCEPTION, PUBLIC RELATIONS	585	SPATIAL INTEGRATION IN BUILT ENVIRONMENT
519	PUBLIC POLICY STUDIES	586	SPEECH COMMUNICATION
520	PUBLISHING	587	SPEECH PROCESSING/TECHNOLOGY
521	PULP TECHNOLOGY	588	STANDARDISATION, STANDARDISATION OF NEW TECHNOLOGIES
522	QUALITY, QUALITY CONTROL, TRACEABILITY	589	STATISTICAL PHYSICS
523	QUANTUM INFORMATION PHYSICS	590	STATISTICS
524	QUANTUM MECHANICS	591	STRUCTURAL BIOLOGY/DETERMINATION/FUNCTION
525	QUANTUM TECHNOLOGY	592	SUPERCONDUCTORS
526	R&D POLICY AND PROGRAMME EVALUATION AND IMPACT ASSESSMENT	593	SURFACE CHEMISTRY
527	RADIODIAGNOSTICS, RADATION BIOLOGY	594	SURFACE PHYSICS
528	RADIOECOLOGY	595	SURVEILLANCE
529	RAILWAY TRANSPORT TECHNOLOGY	596	SURVEYING
530	REACTION MECHANISMS AND DYNAMICS	597	SYNTHESIS AND NEW MOLECULES
531	REACTOR SAFETY	598	SYSTEMS ANALYSIS AND MODELS DEVELOPMENT
532	REFERENCE MATERIALS/METHODS	599	SYSTEMS DESIGN/THEORY
533	REFRIGERATION AND COOLING	600	SYSTEMS ENGINEERING
534	REGIONAL ECONOMICS/STUDIES/DEVELOPMENT	601	SYSTEMS, CONTROL, MODELLING, AND NEURAL NETWORKS
535	REHABILITATION SYSTEMS	602	TECHNOLOGICAL SCIENCES
536	REMOTE SENSING	603	TECHNOLOGY ACCEPTABILITY
537	REPRODUCTIVE HEALTH	604	TECHNOLOGY ASSESSMENT AND FORESIGHT
538	REPRODUCTIVE MECHANISMS	605	TECHNOLOGY EVALUATION/MANAGEMENT
539	RESEARCH METHODOLOGY IN SCIENCE	606	TECHNOLOGY POLICY
540	RESEARCH NETWORKING	607	TECHNOLOGY TRANSFER
541	RESEARCH POLICY	608	TECHNOLOGY WATCH/VALIDATION
542	RESERVOIR CHARACTERISATION AND MONITORING	609	TELECOMMUNICATION ENGINEERING/TECHNOLOGY
543	RESIDUES	610	TELESERVICES, TELE-WORKING, TELE-PAYMENT, TELE-MEDICINE
544	RESPIRATORY SYSTEM	611	TESTING, CONFORMANCE TESTING
545	RE-STRUCTURING OF PUBLIC ADMINISTRATIONS	612	TEXTILES TECHNOLOGY
546	ROAD SAFETY	613	THERAPEUTIC SUBSTANCES
547	ROAD TRANSPORT TECHNOLOGY	614	THERMAL ENGINEERING, APPLIED THERMODYNAMICS
548	RTD SYSTEMS AND POLICIES AND THEIR INTERACTION WITH OTHER RELATED POLICIES	615	THERMODYNAMICS
549	RURAL DEVELOPMENT, RURAL SOCIOLOGY AND SOCIO-ECONOMICS	616	TIMBER ENGINEERING
550	SAFETY TECHNOLOGY	617	TISSUE BANKS/ENGINEERING
551	SAMPLE BANKS	618	TOTAL QUALITY MANAGEMENT
552	SATELLITE (TECHNOLOGY, SYSTEMS, POSITIONING, COMMUNICATION)	619	TOWN AND COUNTRY PLANNING
553	SCIENCE AND TECHNOLOGY INDICATORS	620	TOXICITY AND TOXINOLOGY
554	SCIENCE POLICY	621	TRACTION/PROPULSION SYSTEMS
555	SCIENCE, TECHNOLOGY AND THE MEDIA	622	TRAFFIC CONTROL SYSTEMS
556	SEA FOOD	623	TRAFFIC ENGINEERING/INFRASTRUCTURE/MANAGEMENT SYSTEMS
557	SEARCH AND RESCUE	624	TRANSACTION SYSTEMS
558	SECURITY SYSTEMS	625	TRANSGENE EXPRESSION
559	SEMICONDUCTOR PHYSICS AND TECHNOLOGIES		
560	SENSORY SCIENCE, SENSORS, INSTRUMENTATION		
561	SEROLOGY AND TRANSPLANTATION		
562	SET ASIDE		
563	SIGNAL PROCESSING		

626 TRANSGENIC CROP PLANT
627 TRANSHIPMENT SYSTEMS
628 TRANSPORT DEMAND MANAGEMENT
629 TRANSPORT ECONOMICS
630 TRANSPORT INFORMATION SYSTEMS, FLEET
MANAGEMENT
631 TRANSPORT INFRASTRUCTURE/MANAGEMENT
SERVICES
632 TRANSPORT MODELLING/SCENARIOS
633 TRANSPORT OF GAS AND LIQUID FUELS
634 TRANSPORT POLICY/LAW
635 TRANSPORT SAFETY/SECURITY
636 TRANSPORT TECHNOLOGY/ENGINEERING
637 TRANSPORT TELEMATICS
638 TRANSPORT, TRANSMISSION AND DISTRIBUTION OF
ELECTRICITY
639 TROPICAL AGRICULTURE
640 TROPICAL ECOSYSTEMS
641 TROPICAL FORESTRY
642 TROPICAL MEDICINE
643 URBAN DEVELOPMENT/ECONOMICS
644 URBAN FORESTRY
645 URBAN GOVERNANCE AND DECISION MAKING
646 URBAN QUALITY OF LIFE
647 URBAN SOCIOLOGY
648 URBAN TRANSPORT
649 URBAN: SUSTAINABLE CITIES AND RATIONAL
RESOURCE MANAGEMENT
650 URBAN: TECHNOLOGIES FOR THE BUILT
ENVIRONMENT
651 UROLOGY, NEPHROLOGY
652 USER CENTRED DESIGN, USABILITY
653 USER MODELLING
654 VACCINES
655 VACUUM/HIGH VACUUM TECHNOLOGY
656 VEHICLE TECHNOLOGY
657 VENTURE CAPITAL
658 VESSEL TRAFFIC MANAGEMENT
659 VETERINARY MEDICINE
660 VIRTUAL ORGANISATIONS
661 VIRTUAL REALITY
662 VIRUS, VIROLOGY
663 VULCANOLOGY/SEISMOLOGY
664 WASTE BIOTREATMENT
665 WASTE MANAGEMENT/RECYCLING
666 WATER RESOURCE MANAGEMENT/ENGINEERING
667 WATER TRANSPORT TECHNOLOGY, SHIPBUILDING
668 WATER: FRESH WATER ECOSYSTEMS
669 WATER: HYDROLOGY
670 WATER: MONITORING / QUALITY / TREATMENT
671 WATER: RATIONAL AND EFFICIENT USE
672 WATERBORNE TRANSPORT
673 WAVE/TIDAL ENERGY
674 WEEDS
675 WELFARE STUDIES
676 WETLAND ECOSYSTEMS
677 WIND ENERGY MANUFACTURING/TECHNOLOGIES
678 WIND TURBINE ENVIRONMENTAL IMPACT
679 WIRELESS SYSTEMS, RADIO TECHNOLOGY
680 WOMEN'S STUDIES
681 WOOD ENGINEERED PRODUCTS, PARTICLE AND FIBRE
BOARDS
682 WOOD PROCESSING BY MECHANICAL MEANS
683 WORLD TRADE ORGANISATION

TECHNOLOGICAL IMPLEMENTATION PLAN - GUIDELINES

ANNEX 2:

NACE codes for business activities

Division	Description
<i>Section A</i>	<i>Agriculture, hunting and forestry</i>
01	Agriculture, hunting and related service activities
02	Forestry, logging and related service activities
<i>Section B</i>	<i>Fishing</i>
05	Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing
<i>Section C</i>	<i>Mining and quarrying</i>
10	Mining of coal and lignite; extraction of peat
11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
12	Mining of uranium and thorium ores
13	Mining of metal ores
14	Other mining and quarrying
<i>Section D</i>	<i>Manufacturing</i>
15	Manufacture of food products and beverages
16	Manufacture of tobacco products
17	Manufacture of textiles
18	Manufacture of wearing apparel; dressing and dyeing of fur
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
21	Manufacture of pulp, paper and paper products
22	Publishing, printing and reproduction of recorded media
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products
25	Manufacture of rubber and plastic products
26	Manufacture of other non-metallic mineral products
27	Manufacture of basic metals
28	Manufacture of fabricated metal products, except machinery and equipment
29	Manufacture of machinery and equipment n.e.c.
30	Manufacture of office machinery and computers
31	Manufacture of electrical machinery and apparatus n.e.c.
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks
34	Manufacture of motor vehicles, trailers and semi-trailers
35	Manufacture of other transport equipment
35.1	Building and repairing of ships and boats
35.2	Manufacture of railway and tramway locomotives and rolling stock
35.3	Manufacture of aircraft and spacecraft
a	<i>Manufacture of helicopter</i>
b	<i>Manufacture of aeroplanes for the transport of goods or passengers, for use by the defence forces, for sports or other purposes</i>
c ¹	<i>Manufacture of parts and accessories of the aircraft of this class</i>

¹ Includes: major assemblies such as fuselages, wings, doors, control surfaces, landing gear, fuel tanks, nacelles, airscrews, helicopter rotors and propelled rotor blades, motors and engines of a kind typically found on aircraft, parts of turbojets and turbopropellers

TECHNOLOGICAL IMPLEMENTATION PLAN - GUIDELINES

Division	Description
d ²	<i>Others</i>
36	Manufacture of furniture; manufacturing n.e.c.
37	Recycling
Section E	<i>Electricity, gas and water supply</i>
40	Electricity, gas, steam and hot water supply
41	Collection, purification and distribution of water
Section F	<i>Construction</i>
45	Construction
Section G	<i>Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods</i>
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
Section H	<i>Hotels and restaurants</i>
55	Hotels and restaurants
Section I	<i>Transport, storage and communication</i>
60	Land transport; transport via pipelines
61	Water transport
61.1	Sea and coastal water transport
e	<i>Transport of passenger or freight over water</i>
f	<i>Operation of excursion, cruise or sightseeing boats</i>
g	<i>Operation of ferries, water taxis, etc.</i>
62	Air transport
h	<i>Transport of passenger or freight by airlines</i>
63	Supporting and auxiliary transport activities; activities of travel agencies
63.1	<i>Cargo handling and storage</i>
63.2	<i>Other supporting transport activities</i>
i	<i>Operation of terminal facilities such as harbours and piers, waterway locks etc.</i>
j	<i>Airport and air-traffic control activities</i>
63.3	Activities of travel agencies and tour operators; tourist assistance activities n.e.c.
63.4	Activities of other transport agencies
k	<i>Forwarding of freight</i>
64	Post and telecommunications
Section J	<i>Financial intermediation</i>
65	Financial intermediation, except insurance and pension funding
66	Insurance and pension funding, except compulsory social security
67	Activities auxiliary to financial intermediation
Section K	<i>Real estate, renting and business activities</i>
70	Real estate activities

² This includes: manufacture of gliders, hang-gliders, manufacture of dirigibles and balloons, manufacture of spacecraft and spacecraft launch vehicles, satellites, planetary probes, orbital stations, shuttles, manufacture of aircraft launching gear, deck arresters, etc.

manufacture of ground flying trainers However 35.3 should **exclude**: manufacture of parachutes, military ballistic missiles, ignition parts and other electrical parts for internal combustion engines, instruments used on aircraft, and air navigation systems.

TECHNOLOGICAL IMPLEMENTATION PLAN - GUIDELINES

Division	Description
71	Renting of machinery and equipment without operator and of personal and households goods
72	Computer and related activities
73	Research and development
l	<i>Research and experimental development on natural sciences and engineering</i>
m	<i>Research and experimental development on social sciences and humanities</i>
74	Other business activities
Section L	<i>Public administration and defence; compulsory social security</i>
75	Public administration and defence; compulsory social security
Section M	<i>Education</i>
80	Education
Section N	<i>Health and social work</i>
85	Health and social work
Section O	<i>Other community, social and personal service activities</i>
90	Sewage and refuse disposal, sanitation and similar activities
91	Activities of membership organisations n.e.c.
92	Recreational, cultural and sporting activities
93	Other service activities
Section P	<i>Private households with employed persons</i>
95	Private households with employed persons
Section Q	<i>Extra-territorial organisations and bodies</i>
99	Extra-territorial organisations and bodies