Final Report

DeNUF

Design study for next generation pulsed field magnet user facilities

Design Study

implemented as

Specific Support Action

Contract number: *RIDS-CT-2005-011760*

Project Co-ordinator: *G. Rikken, CNRS-LNCMI*

Project website: *www.denuf.org*

Project duration: *from 01/04/2005 to 31/03/2009*

Project funded by the European Community
under the "Structuring the European Research Area" Specific Programme
Research Infrastructures action

A. ACTIVITY REPORT

Context

High magnetic fields are one of the most powerful tools available to scientists for the study, modification and control of matter. Access to magnetic fields, significantly more intense than those currently available, would have a profound impact across a wide range of disciplines. All previous experience indicates that it would lead to many new and exciting discoveries. This point of view is strongly advocated by the European Science Foundation (ESF) study report "The Scientific Case for a European Laboratory for 100 Tesla Science". This report sets out an overwhelming case for a facility that can provide magnetic fields for research, substantially exceeding the static fields available. Such considerations have led during the last 10 years to major upgrades of the pulsed field user facilities in Los Alamos, Toulouse and Kashiwa (Japan) and the construction of new user facilities in Dresden and Wuhan (China), completed in 2006 and still under construction respectively. These upgraded or new user facilties dispose of much higher energies than earlier installations to power their magnets, using capacitor banks or flywheel generators derived from other high power/high energy applications, like fusion research. However, the corresponding development in magnet technology can not be found elsewhere and has to be done by the pulsed field facilities. The major pulsed field user facilities in Europe (Laboratoire National des Champs Magnétiques Pulsés in Toulouse, the Hochfeld Labor Dresden and the High Field Magnet Laboratory in Nijmegen) have decided to do this development together, to the benefit of all European high field users, within the project Design study for Next generation pulsed field User Facilities (DeNUF). They were joined in their effort by the pulsed field group at the Clarendon Laboratory (Oxford). The project has been running from 1/4/2005 until 31/3/2009, but most of the results (characterization setups, software packages, database etc) are still operational and will continue to be used and improved jointly to the benefit of pulsed field users. All results are documented on the DeNUF website www.denuf.org. Part of the DeNUF activities are now being continued within the context of the FP7-Integrating Activity EuroMagNET2, which unites all European high field user facilities (pulsed field and static field), within a workpackage Magnet Technology (www.euromagnet2.eu)

Project description

The main goal of the DeNUF project was to improve the performance and the reliability of pulsed magnetic field coils in user facilities, in order to better serve the user community. In order to realize these aims, the project was structured into five different, but interrelated work packages.

Coil modeling: Pulsed magnetic field coils are often operated close to the destruction limit. A simple estimate of the force can be made in an analytical way, and results obtained with coils can reliably be scaled. However, the analytical approximations are usually limited to the mid-plane of the magnet. The traditional analytical codes do not treat the ends of the coils such as flanges or coil connectors. The detailed behavior, including heating, cooling and temperature dependent mechanical properties can only be described by extensive Finite Element Analysis (FEA). The DeNUF partners have defined a common set of software tools and protocols and they established a common database, which they are using to share their knowledge of coil designs and of materials parameters relevant for pulsed coil design.

Coil monitoring: In order to verify coil performance in all aspects and to monitor the aging of the coil during use, it is important to accurately determine the mechanical stresses inside coils. To this aim, several methods have been developed within DeNUF like the incorporation of fiber Bragg

grating sensors between coil windings and analysis of spurious pick-up signals outside the coils during pulsing.
Aging: The highest magnetic fields can only be generated if one approaches or even crosses the conductor's plastic limit. So far, very little systematic research has been done on the fatigue effect of conductors under the cryogenic conditions and shock-like forces that are characteristic for pulsed magnets. Within the aging work package, an experimental aging protocol using small scale coils and the corresponding setup have been created.
Rapid cooling: The usefulness of a pulsed magnet is not only determined by its field strength, bore size or pulse duration, but also by its cool down time. There is a clear tendency towards larger coils and higher pulse energies and therefore the cooling time becomes longer, which makes such pulsed field magnets less attractive and efficient for users. Within DeNUF several approaches have been developed to reduce the cool down time.
Multi-coils: The ARMS two-coil system, completed in Toulouse in 2003 by a European consortium funded under FP5, had delivered the proof of principle that it was possible to obtain very high nondestructive pulsed fields by combining a large energy long pulse (and thus large volume) coil with a small coil made of high strength material. Within DeNUF, this principle has been optimized and adapted to the different types of energy sources available at the different partner facilities.

Project results

Management

The management activities within DeNUF have allowed a smooth operation of the project, handling all financial and administrative matters, and the reporting to the EC. In addition, they have organized the submission of a European magnetic field laboratory project to ESRFI, called EMFL. This project was accepted on the ESRFI Roadmap Update in December 2008 (www.emfl.eu) and is now in a planning stage.

Coil modeling: Pulsed magnetic field coils are often operated close to the destruction limit. A simple estimate of the force can be made in an analytical way, and results obtained with coils can be scaled reliably. However, the analytical approximations are usually limited to the mid-plane of the magnet. The detailed behavior, including heating, cooling and temperature dependent mechanical properties can only be described by extensive Finite Element Analysis (FEA) that allows simulating magnet behavior locally. Within DeNUF, the commercial programs COMSOL and ANSYS were chosen as the common platform for pulsed coil FEA. In particular they were adapted and complemented by specific extensions. They are now being used to study:
- distribution and evolution of stresses (pre-stress, thermal stress, magnetic stress, etc.);
- behavior of the wire in the plastic regime, work hardening in the coil, coil fatigue properties;
- optimization of layer to layer transitions, coil flanges and coil connectors;
- temperature distribution, magneto-resistance and skin effect contributions.

In addition, in collaboration with the external expert Prof. Herlach, the analytical program PMDS has been developed and adapted to the needs of the DeNUF coil designers. This program was adapted to provide an interface between ANSYS and COMSOL, so that all coil and material parameters can now be easily transferred between the three programs, which each have their specific advantages and drawbacks, thereby greatly improving the performance and efficiency of pulsed coil design and allowing close collaboration between the engineers at the different facilities.
The DeNUF partners have also established a common database and are using it to share their knowledge of all materials parameters relevant for pulsed coil design. The database has been filled with all the relevant information of which the partners dispose and will continue to be used and improved (see fig. 1)
The joint modeling activities have been essential to all other activities described below, providing predictions and understanding of all aspects of pulsed field coil operation.

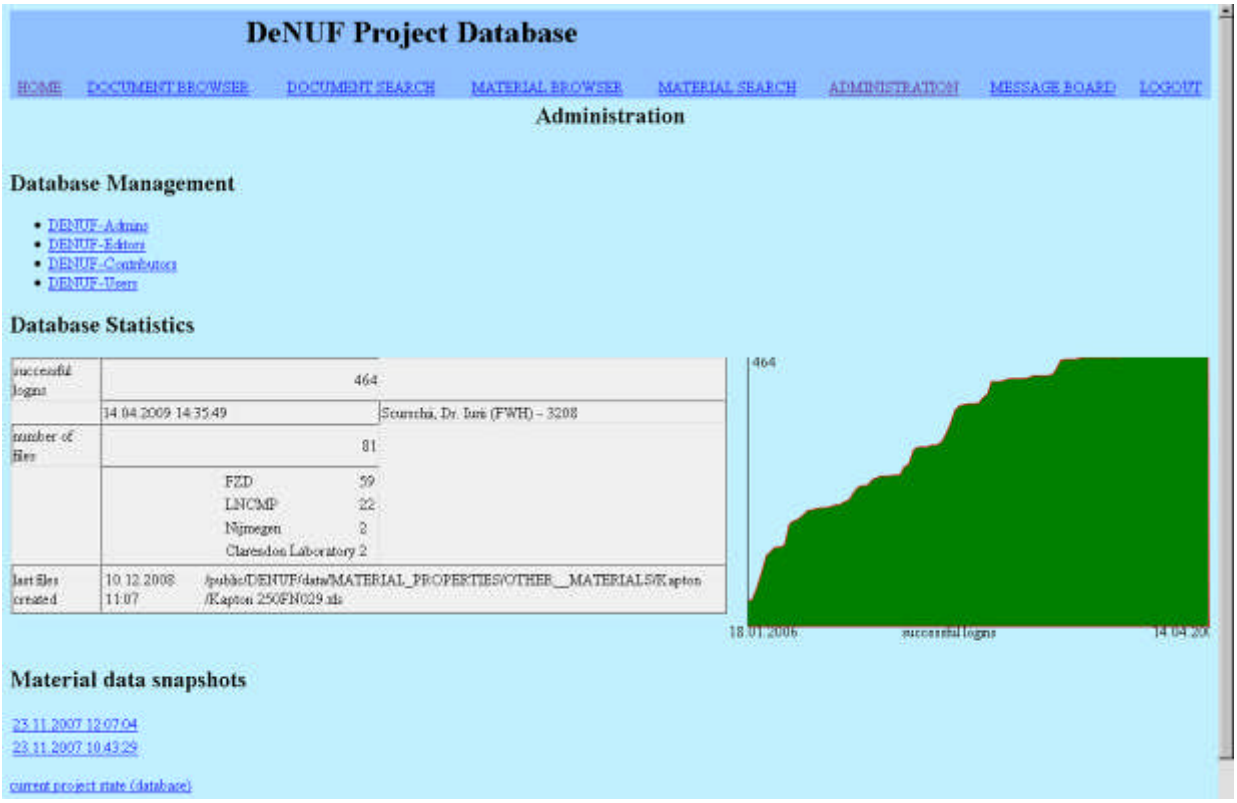


Figure 1. Screen shot of DeNUF materials database window.

Coil monitoring:
In order to verify coil performance in all aspects and to monitor the aging of the coil during use, it is important to accurately determine the mechanical stresses inside coils and to predict imminent failure. To this aim, two methods have been successfully developed within DeNUF.
Fiber Bragg grating sensor monitoring (FSM)
By incorporation of fiber Bragg grating sensors between coil windings, information on real-time in-situ deformation of the coil conductors has been obtained. The sensors are being read out by a broadband solid state source and a small CCD spectrometer (see figure 2). Figure 3 shows a typical result obtained with this setup showing the elastic deformation during the pulse and the thermal expansion after the pulse.
***High-Passed Voltage Picked-up at the Outer Steel* Cylinder** (HPVP-OSC)
The High-Passed (high-frequency filtered) Voltage Picked-up at the Outer Steel Cylinder (HPVP-OSC) appears to be the most sensitive method to detect partial discharges. This new detection method was applied to a user coil during operation at maximum magnetic field, i.e., 68 T. After analyzing the data, it was found that before the final failure the coil demonstrated a largely increased noise (up to 2 orders of magnitude!) in the HPVP-OSC signal (Fig. 4). It can be regarded as a direct and reliable evidence of pre-failure conditions in the coil, followed shortly after by a coil failure.

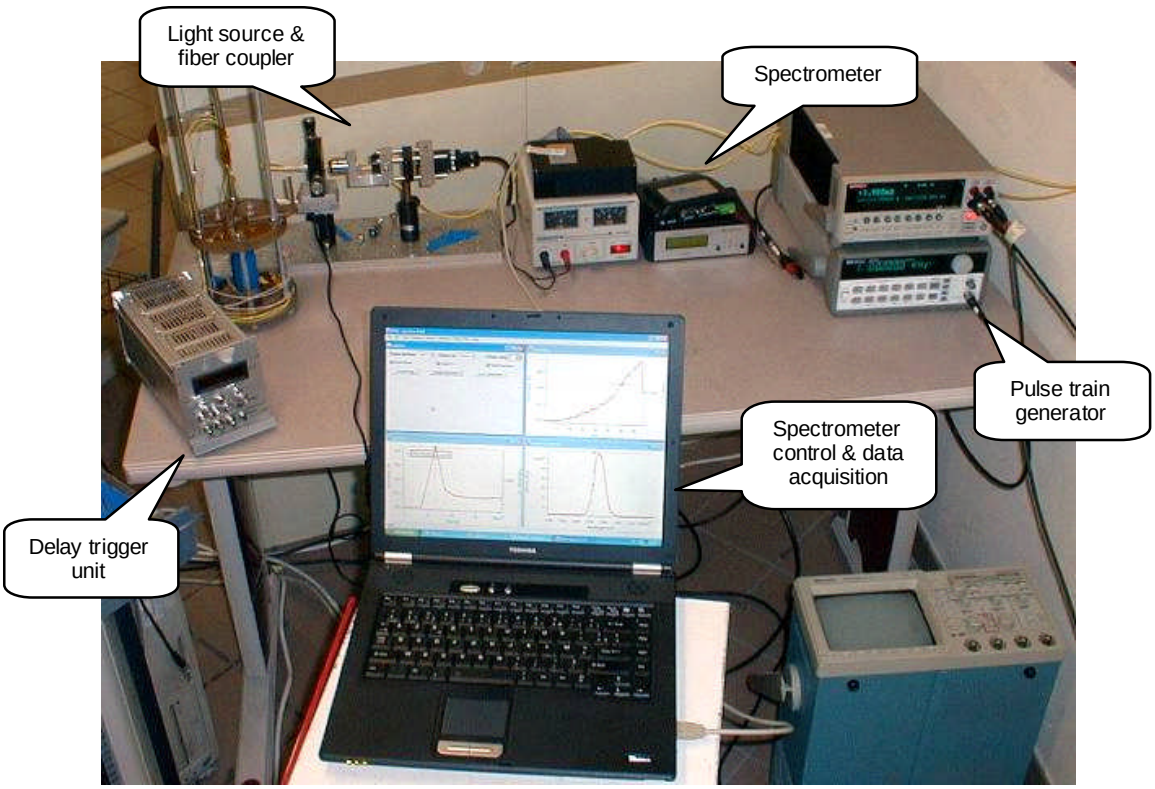


Fig. 2 *: Experimental setup for FSM monitoring with balloons indicating the most essential components. Apart from the optical equipment shown at the top (light source, fiber coupler and single-grating spectrometer) the real time monitoring of deformations in pulsed magnets requires a precise synchronization between the magnetic field pulse and the acquisition of spectra. The latter is realized with the aid of the delay trigger unit (to synchronize the start of optical acquisitions with respect to the firing of the magnet) and the pulse train generator (to actively control the sequence of optical acquisitions during the pulse). Data is stored and automatically evaluated by the PC.*

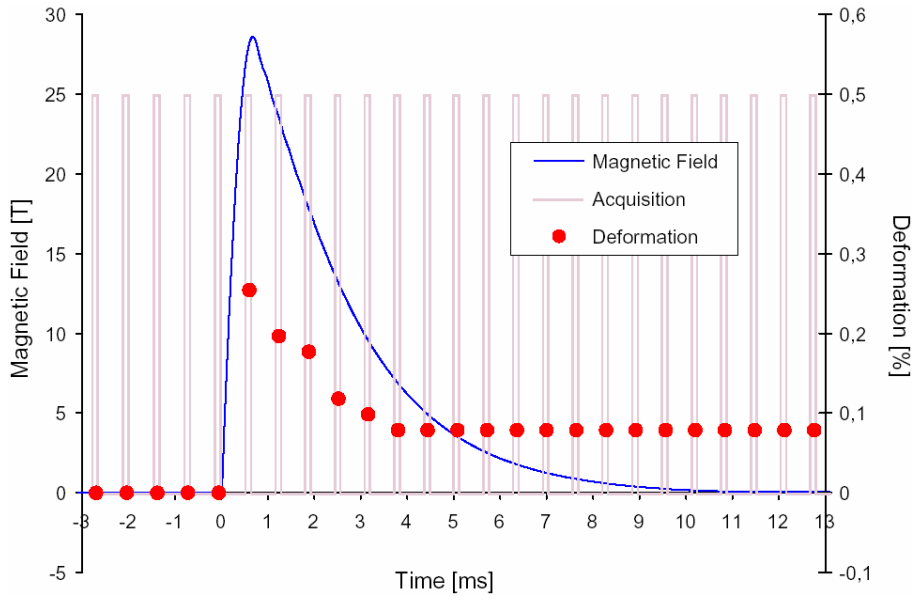
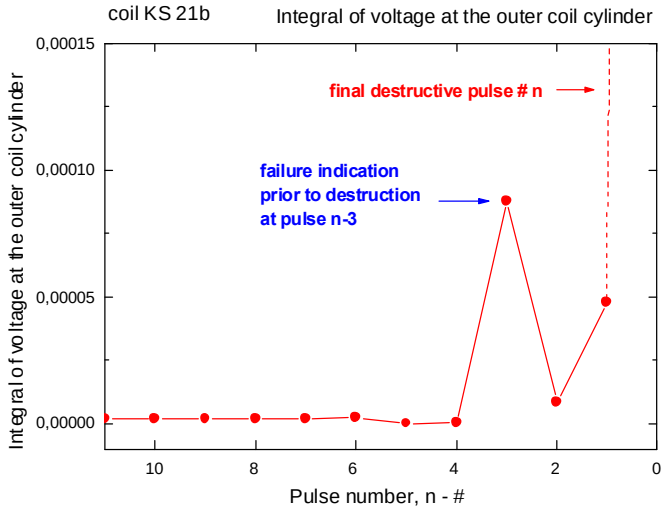


Fig. 3 *: Recording of magnetic field (blue curve), spectrometer reference (violet curve) and coil deformation levels (solid red circles) versus time. The spectrometer reference manifests as rectangular bars indicating exposure (high level) and read out (low level) phases. A spectrum acquired during a given exposure phase can thus be attributed to a magnetic field. Subsequent evaluation of the peak position within the spectrum yield the strain level associated with this field. The residual strain after the field pulse originates from the combined effects of coil heating and plastic deformation. Being irreversible the latter can be identified once the coil has cooled down to its original temperature.*

Fig. 4. *Integrated pickup voltage on outer protection cylinder as a function of the number of shots. Two shots prior to the coil failure, a large enhancement of the pick signal is observed. This technique is now integrated in the DeNUF user coils to obtain statistically relevant information*



Aging: The highest magnetic fields can only be generated if one approaches or even crosses the conductor's plastic limit. So far, very little systematic research has been done on the fatigue effect of conductors under the cryogenic conditions and shock-like forces that are characteristic for pulsed magnets. Within DeNUF an experimental aging protocol using small scale coils and the corresponding setup have been created. A systematic study of fatigue behavior of small coils, made of different conductors is ongoing. A typical result is shown in figure 5.
In particular, the effect of impregnation on aging behaviour and the behaviour of Zylon reinforcement fibers under cryogenic conditions have been studied. In addition, and beyond the original strategy of DeNUF, the use of neutron scattering to study aging of the conductor has been developed.

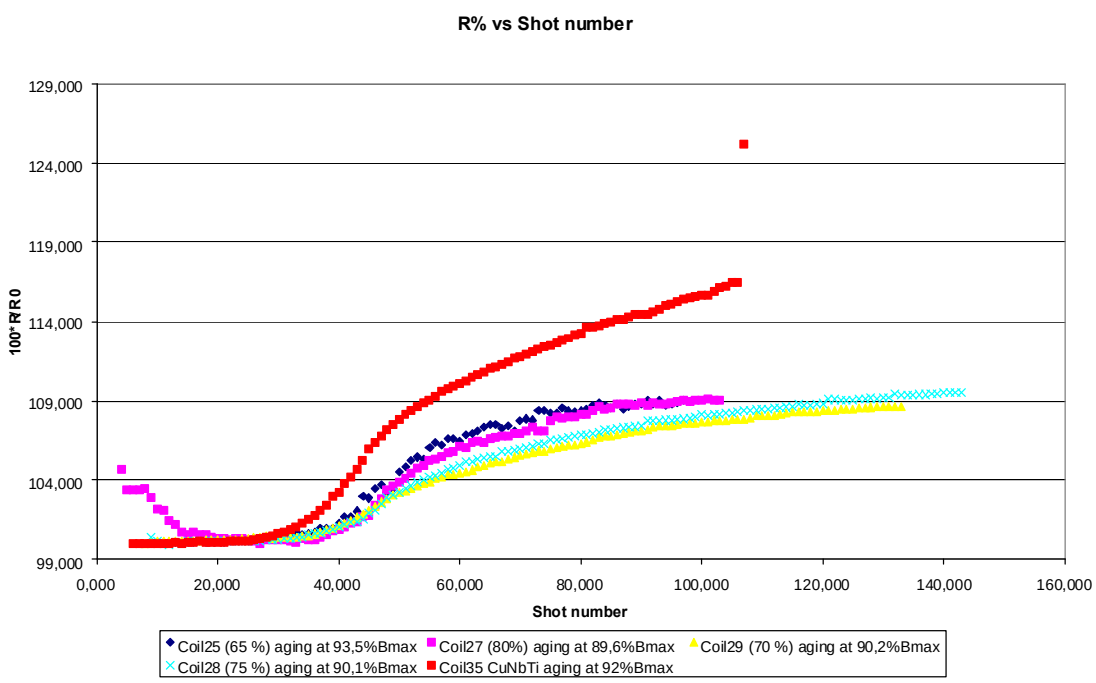
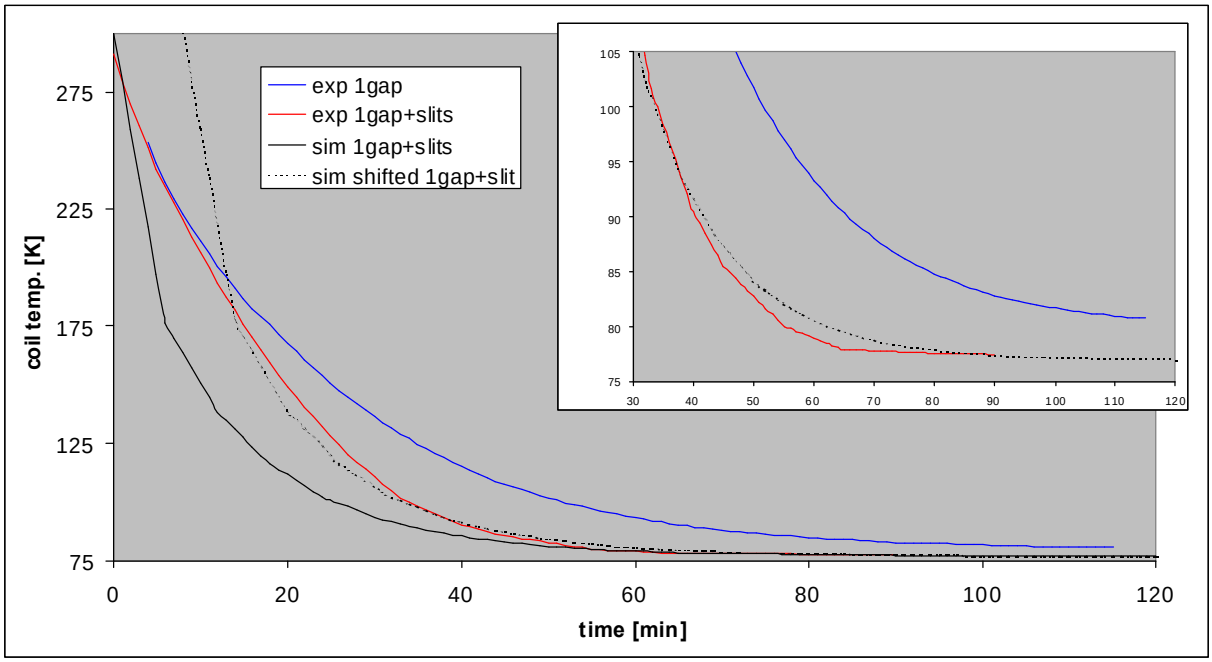


***Figure 5**: Aging measurement through **r**esistance evolution, at 77K, versus shot number for CuNbTi mini-coil (n°35) and CuSS mini-coils aged at 90%B_{max} (n°25, 27, 28, 29)*

Rapid cooling: The usefulness of a pulsed magnet is not only determined by its field strength, bore size or pulse duration, but also by its cool down time. There is a clear tendency towards larger coils and higher pulse energies and therefore the cooling time becomes longer. Within DeNUF several approaches have been studied to reduce the cool down time. One of them, the cooling slit, has already led to a reduction of the cooling time by a factor of three and is in use at the user facilities. Reductions in cooling time up to a factor of 3.7 have been obtained, thereby greatly increasing the number of shots a user can do during a day. In order to establish the ultimate limits for pulsed field duty cycles, research into the cooling efficiency of different cryogens has started which promises even larger reductions of the cooling time.

Fig. 6 Experimental results and simulations of the effect of an axial cooling gap and radial cooling slits on the cool-down time of a Cu-Zylon coil.



Multi-coils: The ARMS two-coil system has delivered the proof of principle that it is possible to obtain very high nondestructive pulsed fields by combining a large energy long pulse (and thus large volume) coil with a small coil made of high strength material. Within DeNUF, this principle is now being optimized and being adapted to the different types of energy sources available at the different partner facilities, i.e. a 14 MJ capacitor bank in Toulouse, a 50 MJ modular capacitor bank in Dresden and a 20 MW continuous power supply in Nijmegen. In close collaboration with the modeling activities, the optimal trade-off between inner and outer coils, taking into account the energy source, available materials and experiment requirements (e.g. bore diameter and pulse duration) was determined. Based on these modeling considerations, several prototypes were build and tested in Toulouse and Dresden. The new Toulouse dual coil has produced 81 T, a significant improvement over the Toulouse ARMS coil (76 T), whereas the most recent Dresden prototype has produced 87 T (figure 7), a new European record, and close to the world record (89 T). This latter coil is now in use for user experiments. Based on the information obtained from this system, improved dual coil systems are already under construction in Dresden and Toulouse, promising further improved performance for the pulsed field user community.

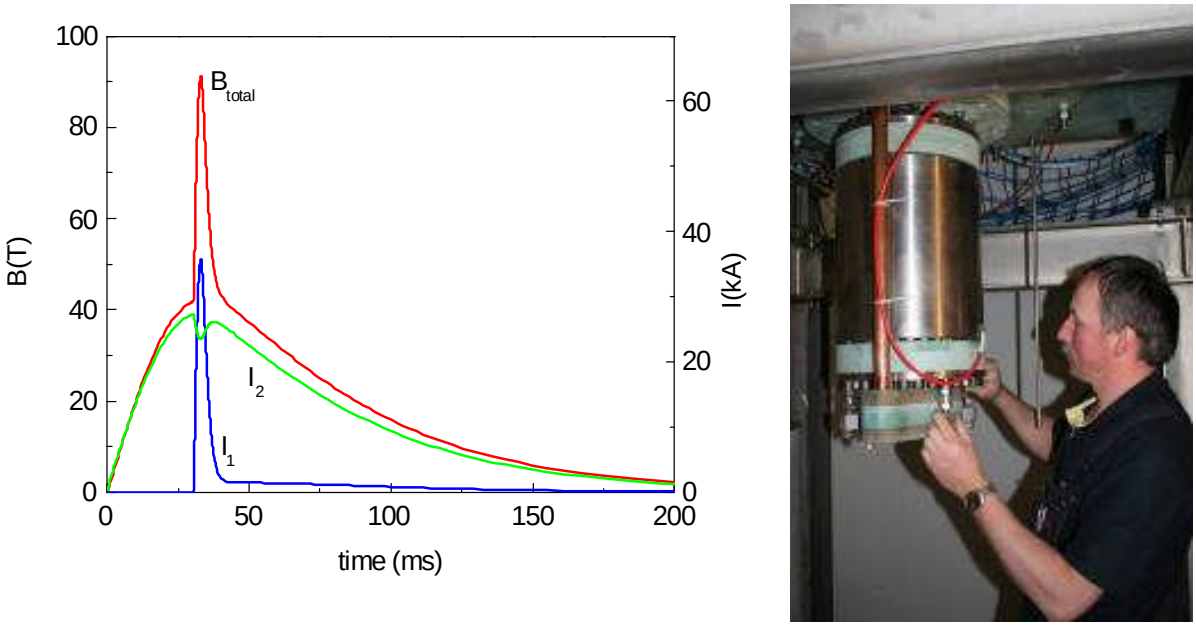


***Figure 7**. Field pulse produced by the 87 Tesla Dresden dual coil system (on the right).*

Dissemination and use

All results obtained by the DeNUF partners are in the public domain. They can be found on the DeNUF website (www.denuf.org) and they have been or will be published in the open literature. Commercial application of the results does not seem feasible in view of the virtually non-existent industrial application of high pulsed magnetic fields. The improved performance of the pulsed field facilities is now available to all qualified European users through the Transnational Access program of EuroMagNET2 (www.euromagnet2.eu).

B. FINAL MANAGEMENT REPORT (FINANCIAL INFORMATION)

Summary Financial Report

Type of Instrument	SSA	Project Title (or Acronym)	DeNUF	Contract N°	11760
Reporting period number	FINAL	From (dd/mm/yyyy)	01-avr	To (dd/mm/yyyy)	31-mars

Contractor n°	Organisation Short Name	Cost model used	Eligible costs (in €)	Type of activities: Research and Technological Development / Innovation (A)			Demonstration (B)			Training (C)			Management of the consortium (D)			Other Specific Activities (E)			Total eligible costs (F)=(A)+(B)+(C)+(D)+(E)			Receipts		
				Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)
1	CNRS-LNCMP	F	Direct eligible costs										161 794,83 €	0,00	0,00	1 074 129,15 €	0,00	0,00	1 235 923,98 €	0,00	0,00			
			of which direct eligible costs of subcontracting										0	*0,00*	*0,00*	0	*0,00*	*0,00*	0	*0,00*	*0,00*			
			Indirect eligible costs										32 358,96 €	0,00	0,00	214 825,83 €	0,00	0,00	247 184,79 €	0,00	0,00			
			Adjustment on previous period(s)										0	0,00	0,00	0	0,00	0,00	0	0,00	0,00			
			Total eligible costs										**194 153,79 €**	***0,00***	***0,00***	**1 288 954,98 €**	***0,00***	***0,00***	**1 483 108,77 €**	0,00	0,00			
2	RU-HFML	NL	Direct eligible costs										824,5	2 753,00	0,00	330 671,69	0,00	0,00	331 496,19	2 753,00	0,00			
			of which direct eligible costs of subcontracting										0	*0,00*	*0,00*	0	*0,00*	*0,00*	*0,00*	*0,00*	*0,00*			
			Indirect eligible costs										0	0,00	0,00	66 134,53	0,00	0,00	66 134,53	0,00	0,00			
			Adjustment on previous period(s)										0	0,00	0,00	11544,22	0,00	0,00	11 544,22	0,00	0,00			
			Total eligible costs										824,5	***2 753,00***	***0,00***	408 350,44	***0,00***	***0,00***	409 174,94	2 753,00	0,00			
3	FZR-HLD	D	Direct eligible costs										0,00	0,00	0,00	1 050 495,83	0,00	0,00	1 050 495,83	0,00	0,00			
			of which direct eligible costs of subcontracting										*0,00*	*0,00*	*0,00*	1 040,00	*0,00*	*0,00*	*1 040,00*	*0,00*	*0,00*			
			Indirect eligible costs										0,00	0,00	0,00	209 861,35	0,00	0,00	209 861,35	0,00	0,00			
			Adjustment on previous period(s)										0,00	0,00	0,00	0	0,00	0,00	0,00	0,00	0,00			
			Total eligible costs										***0,00***	***0,00***	***0,00***	1 260 357,18	***0,00***	***0,00***	1 260 357,18	0,00	0,00			
4	UOXF-DK	GB	Direct eligible costs										1820,85	0,00	0,00	69 989,05	0,00	0,00	71 809,90	0,00	0,00			
			of which direct eligible costs of subcontracting										0	*0,00*	*0,00*	0	*0,00*	*0,00*	*0,00*	*0,00*	*0,00*			
			Indirect eligible costs										193,02	0,00	0,00	14 758,19	0,00	0,00	14 951,21	0,00	0,00			
			Adjustment on previous period(s)										0	0,00	0,00	0	0,00	0,00	0,00	0,00	0,00			
			Total eligible costs										2013,87	***0,00***	***0,00***	84 747,24	***0,00***	***0,00***	86 761,11	0,00	0,00			
			Total eligible costs										**196 992,16**	**2 753,00**	**0,00**	**3 042 409,84**	**0,00**	**0,00**	**3 239 402,00**	**2 753,00**	**0,00**	0,00	0,00	0,00
													2 753,00	**0**	**0**	**3 042 409,84**	**0**	**0**	**1 477 544,12**	**0**	**0**			0,00
			Requested EC contribution for the reporting period (in €) without taking into account receipts										**196 992,16**	**2 753,00**	**0,00**	**1 767 753,76**			**1 967 498,92**					

Requested EC contribution for the reporting period (in €) taking into account receipts [=Periodic Invoice]	**1 967 498,92**
Amount of the financial interests generated by the prefinancing	**0,00**

Personnel effort for the whole duration of the project

TASKS		P1 -CNRS FCF		P2 - RU AC		P3 - FZR FCF		P4 -UOX AC		Total	
		total	*charged*	*total*	*charged*	*total*	*charged*	*total*	*charged*	*total*	*charged*
Consortium management activity	*actual*	**28,4**	**28,4**	**2**	**0**	**0**	**0**	**2**	**0,5**	**32,4**	**28,9**
	planned	**17**	**17**	**0**	**0**	**0**	**0**	**0**	**0**	**17**	**17**
Modeling	*actual*	**64,8**	**64,8**	**10**	**4**	**53**	**53**	**7**	**5**	**134,8**	**126,8**
	planned	**24**	**24**	**24**	**12**	**48**	**48**	**7**	**5**	**103**	**89**
Monitoring	*actual*	**46**	**46**	**0**	**0**	**56,67**	**56,67**	**0**	**0**	**102,67**	**102,67**
	planned	**24**	**24**	**0**	**0**	**36**	**36**	**0**	**0**	**60**	**60**
Aging	*actual*	**44,7**	**44,7**	**0**	**0**	**0**	**0**	**36**	**9,9**	**80,7**	**54,6**
	planned	**36**	**36**	**0**	**0**	**0**	**0**	**30**	**9**	**75**	**45**
Rapid Cooling	*actual*	**39**	**39**	**0**	**0**	**42,85**	**42,85**	**15**	**1,6**	**96,85**	**83,45**
	planned	**36**	**36**	**0**	**0**	**48**	**48**	**14**	**4**	**102**	**88**
Multi coil	*actual*	**16,5**	**16,5**	**92**	**66**	**58,75**	**58,75**	**7,5**	**0,4**	**174,75**	**141,65**
	planned	**48**	**48**	**84**	**36**	**48**	**48**	**10**	**4**	**194**	**136**
Total	*actual*	**200,4**	**200,4**	**104**	**70**	**168,42**	**168,42**	**67,5**	**17,4**	**622,17**	**454,62**
	planned	**149**	**149**	**108**	**48**	**180**	**180**	**61**	**22**	**551**	**435**

C. PRELIMINARY REPORT ON THE DISTRIBUTION OF THE COMMUNITY FINANCIAL CONTRIBUTION, TO BE COMPLETED

Type of Instrument	Design Study	Project Title (or Acronym)	DeNUF		11760

Part I — Community's prefinancing (or payment) sent to the coordinator (1)

	Reporting Period 1 (2)		Reporting Period 2 (2)		Reporting Period 3 (2)		Reporting Period 4 (2)		Final payment		Total Amount (I) (3)
	From	To	From	To	From	To	From	To			
	1/04/2005	31/03/2006	1/04/2006	31/03/2007	1/04/2007	31/03/2008	1/04/2008	31/03/2009			
	Date	Amount (A)	Date	Amount (B)	Date	Amount (C)	Date	Amount (D)	Date	Amount (H)	
Total (X)	1/05/2005	568 000,00	8/08/2006	385 724,08	5/10/2007	509347,77	2/6/2008	229942,52			1463071,85

Part II — Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) (4)

Contractor n°	Organisation Short Name	Country Code	Reporting Period 1		Reporting Period 2		Reporting Period 3		Reporting Period 4		Final payment		Total Amount (I') (6)
			Date(s) (5)	Amount(s) (A') (5)	Date(s) (5)	Amount(s) (B') (5)	Date(s) (5)	Amount(s) (C') (5)	Date(s) (5)	Amount(s) (D') (5)	Date(s) (5)	Amount(s) (H') (5)	
1	CNRS-LNCMP	F	4/05/2005	211 121,69	21/9/2006	143 373,64	10/10/2007	240347,77	20/6/2008	50942,52		?	645785,62
													0,00
													0,00
													0,00
			Total	211 121,69	Total	143 373,64	Total	240347,77	Total	0,00	Total	0,00	645785,62
2	RU-HFML	NL	4/05/2005	132 984,13	21/9/2006	90 298,01	10/10/2007	900000	20/6/2008	67 000		?	380282,14
													0,00
													0,00

													0,00
			Total	132 984,13	Total	90 298,01	Total	900000	Total	67000	Total	0,00	380282,14
3	FZR-HLD	D	4/05/2005	193 691,01	21/9/2006	131531,91	10/10/2007	155000	20/6/2008	90 000		?	570222,96
													0,00
													0,00
													0,00
			Total	193 691,01	Total	131 531,91	Total	155000	Total	90000	Total	0,00	570222,96
4	UOXF-DK	GB	4/05/2006	30 203,17	21/9/2006	20 520,52	10/10/2007	240000	20/6/2008	20 000		?	94723,69
													0,00
													0,00
													0,00
			Total	30 203,17	Total	20 520,52	Total	240000	Total	20000	Total	0,00	94723,69
Total (Y)			Total	568 000,00	Total	385 724,08	Total	509347,77	Total	227942,52	Total	0,00	1691014,41

Part III	Difference between Community's prefinancing (or payment) sent to the coordinator and Total Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) *(4)*

	Reporting Period 1	Reporting Period 2	Reporting Period 3	Reporting Period 4	Final payment	Total Amount
Community's prefinancing (or payment) not yet distributed between contractors (Z) *(7)*	0,00	0,00	0,00	0,00	0,00	0,00

I certify that the information set out in this(these) form(s) is accurate and correct and agreed by all contractors.

Name *(8)*	Surname *(8)*	Date (dd/mm/yyyy)	Administrative official CNRS
Rikken	Geert	11/07/2009	Barelli, Armelle

D. QUESTIONNAIRES

Appendix 1 – Science and society reporting questionnaire

Science and Society Reporting Questionnaire

Introduction

FP6 was designed to focus, integrate, structure and strengthen the European Research Area (ERA). The influence of science and technology on society was acknowledged when the ERA was established and the importance of having a healthy dialogue between science and society was recognised. This area now forms part of the policy to structure the ERA under the heading Science and Society. It incorporates ethical, gender and communications issues together with issues affecting education and youth and governance.

This questionnaire has been compiled for FP6 Project Coordinators. It has been designed to help coordinators respond to contractual reporting requirements (Article II.10.3 of the contract states that consortia must engage with actors beyond the research community) and to facilitate the monitoring of the science and society dimension in FP6.

The information gathered through this exercise will be confidential and will not be disclosed to any third parties or used in any way that could be linked to individual projects.

Please complete the questionnaire by ticking boxes or filling out information where requested. It would be appreciated if as many questions as possible could be completed.

Please note that Part A will be completed automatically when the contract number is entered.

A General Information on Contractor

1	**Contract Number:**	*RIDS-CT-2005-011760*
2	**Instrument:**	Design Study Specific Support Action
3	**Thematic Priority:**	Infrastructures
4	**Title of Project:**	***Design study for next generation pulsed field magnet user facilities***
5	**Name and Title of Coordinator:**	Dr. G. Rikken
6	**Period Covered, Start Date:**	01/04/05 **End Date:** 30/03/09
7	**EC Contribution to project:**	€ 1 900 000

B Ethics

8 Which (if any) of the following does your research project involve?

- ❑ Human beings
- ❑ Human biological samples
- ❑ Personal data
- ❑ Genetic information
- ❑ Animals
- ❑ Human embryos or human embryonic stem cells
- ❑ Non human primates and other animals
- ● None of the above

9 To what extent do you believe ethical issues are relevant to your research project?

- ● Not relevant
- ○ Minor relevance
- ○ Significant relevance
- ○ Critical

10 Do you have Ethicists or others with considerable ethics experience involved in the project?

- ○ Yes
- ● No

11 Did your project have a separate EC ethical review?

- ○ Yes
- ● No

12 How much (including the value of time spent, as well as paid-out costs) do you estimate your project (when it is completed) will have spent on considering and dealing with ethical issues?

€ 0

C Gender

13a Did you undertake Gender Equality Actions in your research project?

- ○ Yes
- ● No

13b If no, why not?

- ● Not relevant
- ○ Team not gender aware
- ○ No budget
- ○ Not supported (no will)
- ○ Other:

13c If yes, which of the following actions did you carry out and how effective were they?

	Not at all effective				Very effective
❑ Design and implement an equal opportunity policy	○	○	○	○	○
❑ Implement mentoring schemes for women	○	○	○	○	○
❑ Family friendly working conditions	○	○	○	○	○

14 Was there a gender dimension associated with the research content?

- ○ Yes. If yes, please specify
- ● No

15 How much (including the value of time spent, as well as paid-out costs) do you estimate your project (when it is completed) will have spent on considering and dealing with gender issues?

€ 0

D Science Education, Training and Career Development

16a Does this project anticipate having a direct impact on the local economy?

- ● Yes
- ○ No

16b If Yes, is the project:

- ❑ Stimulating employment
- ● Retaining highly trained personnel
- ❑ Creating possible spin-out/start-up companies

17 Does your partnership employ and train researchers?

- ● Yes
- ○ No

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18 Does your project involve working with young people at schools?

- ○ Yes
- ● No

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19 Is there any education material being produced directly or indirectly by your project?

- ● Yes
- ○ No

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20 How much (including the value of time spent, as well as paid-out costs) do you estimate your project (when it is completed) will have spent on considering and dealing with Science Education, Training and Career Development issues? 50 k€

E Engaging With Actors Beyond the Research Community

20a Is the project likely to generate outputs (expertise or scientific advice) which could be used by policy makers?

- ● Yes
- ○ No

20b If Yes, is this a primary or secondary objective of the project?

- ○ Primary
- ● Secondary

21a Did your project engage in significant communication with the public before research commenced?

- ○ Yes
- ● No

21b Was the focus or methodology of your project modified in response to any communication with the public?

- ○ Yes
- ● No

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22 Does your project involve someone whose role is solely to communicate with the public?

○ Yes
● No

F Use and dissemination

23 How many articles were published ?

In refereed journals: [ ] Other journals: [ ]

24 How many patents have been applied for ?

[0]

25 How many other Intellectual Property Rights were applied for?

[0]

26 How many spin-offs were created? 0

27 Have you issued press releases related to your project (and if so, how many)?

● Yes, number: [2]
○ No

28 Have you held media briefings? If so, how many, and on average roughly how many journalists attended?

○ Yes, number of briefings: [ ] average number of journalists: [ ]
● No

29a Roughly how many items covering your project in the printed press, on radio or television can you identify?

Press: 2 Radio: Television:

29b Roughly how many items were:

Specialist Press:

Non-specialist Press:

National Press: 2

International Press:

30a Was there on-line information about the project?

- ○ Yes
- ● Specific web site
- ○ No

30b Roughly how frequently has it been updated?

10 times in 4 years

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31 Do you have an e-mail mailing list to send news about the project? If so, how many subscribers to the list are there?

- ● Yes, number of subscribers: 30
- ○ No

32a Have you created or participated in an event (e.g. workshop, conference, information day) in order to communicate with the public (not just other researchers or the press)?

- ● Yes
- ○ No

32b Roughly how many people attended these events and learned about your project?

200

33a Have you produced a video or DVD film about your project?

- ○ Yes
- ● No

33b If so, how effective do you believe it has been in communicating with the public?

- ○ Unable to assess
- ○ Completely ineffective
- ○ Mostly ineffective
- ○ Partially effective
- ○ Significantly effective
- ○ Extremely effective

34a Have you produced posters, flyers or brochures about your project?

- ○ Yes
- ● No

34b If so, how effective do you believe they have been in communicating with the public?

- ○ Unable to assess
- ○ Completely ineffective
- ○ Mostly ineffective
- ○ Partially effective
- ○ Significantly effective
- ○ Extremely effective

35 In how many different languages were these products (video/DVD, posters, flyers, brochures) produced?

[ ]

36 How have you distributed these products (video/DVD, posters, flyers, brochures)? Please tick all methods you have used.

- ❑ Sent on request
- ❑ Sent to schools/academic institutions
- ❑ Distributed through government agencies/public buildings/libraries etc.
- ❑ Sent to potentially interested non-governmental bodies (NGOs, citizen's associations etc)
- ❑ Other: [ ]

G Total Communication Spend

37 How much (including the value of time spent, as well as paid-out costs) do you estimate your project (when it is completed) will have spent on communication activities (engaging with the public, use and dissemination) as described in the current questionnaire?

€ 30 000

H Comments

38 If you have any comments about your experience of meeting the Science and Society objectives within your project, or any suggestions of improvements to the programme please add them here:

Thank you for your help!

Appendix 2 – final reporting questionnaires on workforce statistics

WORK FORCE STATISTICS
FINAL REPORT

This report is part of the final reporting to be completed by the contractors of all projects at the end of the project.

1. GENERAL INFORMATION

1.1. Contract No.: RIDS-CT-2005-011760

1.2. Thematic priority: Infrastuctures

1.3. Instrument type: Design study implemented as a Specific Support Action

1.4. Project acronym: DeNUF

1.5. Period covered (Start Date – End Date)[1]: 01/04/05 31/03/09

1.6. Name and title of co-ordinator[1]: Dr. G. Rikken

1.7. Name and title of contractor: CNRS - Dr. A. Barelli

2. SCIENTIFIC LEADERSHIP AND MANAGEMENT, AND WORKFORCE STATISTICS FOR THE PROJECT TO BE COMPLETED BY CONTRACTORS

Please complete the table below on a Headcount basis (Previously supplied data will be inserted automatically)

Type of Position	Number of Women	Number of Men	Total	% Women	% Men
Scientific manager	0	1	1	0	100
Scientific team leader / work package manager	1	4	5	20	80
Experienced researcher (> 4 years)	0	4	4	0	100
Early researcher (<= 4 years)	1	3	4	25	75
PhD students	2	4	6	33	67
Technical staff	3	17	20	15	85
Other	0	0	0		

Appendix 3 – Socio-economic reporting questionnaire

SOCIO-ECONOMIC REPORTING QUESTIONNAIRE

(To be completed by each contractor in the project)

INTRODUCTION

In the process of building the European Research Area, democratic governance must ensure that social and economic issues are taken into consideration in the research activities and that citizens are informed about and aware of the social aspects with regard to scientific and technological progress. In this context, it is also acknowledged that the benefits of research in support of socio-economic policy challenges would be enhanced by an appropriate integration of socio-economic research dimensions.

The importance of the integration of socio-economic aspects in research was recognised in FP6 and should be duly taken into consideration by contractors where relevant for the actions concerned in horizontal and thematic activities of FP6.

This questionnaire applies to all projects and must be filled in by each contractor in the project. It is designed to facilitate the monitoring of the integration of the socio-economic dimensions in FP6 and to finally support the assessment of the research that will guide the future policy formulations and decisions.

The submission of this questionnaire will be done on-line.

The information gathered through this exercise will be kept confidential and will not be disclosed to any third parties or used in any way that could be linked to individual projects.

QUESTIONS

1.1 Do your tasks in the project include socio-economic research activities[1] ?	No
1.2 If "Yes", what is the estimated total budget allocation that addresses these activities ?	*(Cost in Euro or N/A)*
2.1 Do your tasks in the project include foresight methods[2] ?	YES

[1] - Ex-ante or ex-post assessments (or contribution to such analysis e.g. cost-benefit/cost-effectiveness studies, etc…) of the expected impact of the knowledge and/or technology generated from the research (project, programme or framework programme), as well as analysis of the factors that would influence their exploitation (e.g. statistical indicators, standardisation, ethical and regulatory aspects, impact on consumers and markets, public awareness/acceptance and understanding of science, political/societal and/or economic implications, etc…)
- Any type of models or tools to support the assessment of impact on society, economy and businesses resulting from the deployment of new services or technologies.
- Any research seeking both a better integration of Science in Society and Society in Science.
- Any type of research aiming at understanding the societal and economic phenomena (research in social sciences and humanities)
- Actions e.g. assessments, tools & methods, comparative research, etc to support the formulation and implementation of Community policies.
- Any type of activity involving scientist(s) with a specific background in social, political sciences or in economy (discipline approach).

[2] Any type of foresight, i.e. participative vision-building approaches, future studies and forward looking activities, including scenarios of the evolution of Europe's potential in a related field, forecasting, prospective studies, forward looks, etc.

2.2 If "Yes", what is the estimated total budget allocation that addresses these activities?

15 k€

3. How many person/months (estimated) are allocated to researchers with a background in social sciences[3], to perform your tasks for the project ?

0

[3] Domains of academic disciplines covered by the social sciences are: Psychology, Economics, Education sciences, Anthropology (social and cultural) and ethnology, Demography, Geography (human, economic and social), Town and country planning, Management, Law, Linguistics, Political sciences, Sociology, Organisation and methods, Miscellaneous social sciences and interdisciplinary.