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CETRAD
Coordination Action on Education and Training in Radiation Protection and Radioactive Waste Management

Instrument: Coordination Action.
Thematic Priorities: Management of Radioactive Waste, Radiation Protection, Education and Training.

Deliverable 7
Project Workshop

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Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	x
RE	Restricted to a group specified by the partners of the [CETRAD] project	
CO	Confidential, only for partners of the [CETRAD] project	

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CHAPTER 1: INTRODUCTION

1.1 Introduction

As outlined in the Project Plan Document (Deliverable 1), Work Package 5 involved the organisation of a Project Workshop (Deliverable 7), the agenda and minutes of which are outlined in this report.

The key objective of the Work Package as outlined in the Project Plan (Deliverable 1) was to organise and run an open-access workshop to disseminate the findings of the study.

1.2 Workshop Objectives

Under the framework of the CETRAD project, specific objectives of the workshop on Education and Training in Radioactive Waste Management included:

- Presentation of results of a pan-European review of education and training needs in the field of radioactive waste management related to geological disposal.
- Presentation of an outline proposal to address the needs identified by the review.
- Development of proposal details ensuring representation of requirements and views of both stakeholders and education and training providers.

1.3 Workshop Structure

The workshop was held on 9th and 10th of March 2005 and consisted of a mix of plenary sessions and parallel working group sessions over the two days.

Day 1: Plenary Session

A series of presentations and discussions on i) education and training across the European Union in the area of radioactive waste management and ii) proposals to address these needs.

Day 2: Working Group Sessions & Final Plenary Session

Two parallel working group sessions and a final plenary session were held:

Working Group 1 – Prototype Board (Identifying requirements)
Chaired by Dr Alan Hooper (Nirex) this session identified specific requirements and explored the proposals from the stakeholders' and users' perspective.

Working Group 2 – Providers' Forum (Identifying delivery mechanisms)
Chaired by Prof Neil Chapman (ITC) this session identified specific delivery mechanisms, and explored the proposals from the education and training providers' perspective.

Final Plenary Session
This involved the presentation and discussion of outcomes of the parallel working group sessions. Subsequently a general discussion was held, including a closing workshop summary and wrap-up.

1.4 Participation and attendance

The meeting involved most of the CETRAD partners and members of the RWM industry involved with education and training. Table 1 presents the workshop delegate list.

Table 1: Workshop Delegate List

Individual Name	**Organisation**	**Country**
Dr Jonathan Billowes	Dalton Nuclear Institute, University of Manchester	United Kingdom
Petra Blaser	ITC School of Underground Waste Storage and Disposal,	Switzerland
Prof Wernt Brewitz	Gesellschaft fuer Anlagen-und Reaktorsicherheit (GRS) mbH	Germany
Dr Peter Cleall	Geoenvironmental Research Centre, Cardiff University	United Kingdom
Prof Neil Chapman	ITC School of Underground Waste Storage and Disposal,	Switzerland
Dr Michèle Coeck	SCK*CEN	Belgium
Olivia Comsa	Centre of Technology and Engineering for Nuclear Projects	Romania
Christophe Davies	European Commission	Belgium
Dr Alessandro Dodaro	Ente Nazionale per le Nuove Tecnologie, l'Energia e l'Ambiente,	Italy
Dr Lara Duro	ENVIROS Spain S.L.	Spain
Dr Elorza Javier	Universidad Politecnica de Madrid	Spain
Prof Jan John	Czech Technical University Prague	Czech Republic
Sven Hardersen	Technische Universitat Clausthäl, Institut Für Mineralogie	Germany
Dr Alan Hooper	United Kingdom Nirex Ltd	United Kingdom
Dr Markus Hugi	Nagra	Switzerland

Markku Kettunen	POSIVA OY	Finland
Dr Wolfgang Kickmaier	National Cooperative for the Disposal of Radioactive Waste	Switzerland
Dr Meritxell Martel	ENVIROS Spain S.L.	Spain
Isabelle Majkowski	SCK*CEN	Belgium
Dr Irena Mele	Agency for Radwaste Management	Slovenia
Prof Kurt Mengel	Technische Universitat Clausthäl, Institut Für Mineralogie	Germany
Zoltan Nagy	PURAM	Hungary
Nicolette Pace	Geoenvironmental Research Centre, Cardiff University	United Kingdom
Marjatta Palmu	POSIVA OY	Finland
Dr Isabel Paiva	DPRSN / Instituto e Technológico Nuclear	Portugal
Dr Lyubomir Pironkov	Kozloduy NPP Training Centre	Bulgaria
Jan-Marie Potier	International Atomic Energy Agency (IAEA)	Austria
Dr Kari Rasilainen	VTT Processes	Finland
Dr Isabel Santos	Instituto Technológico e Nuclear	Portugal
Peter Salzer	DECOM Slovakia	Slovak Republic
Gerhard Schmidt	OEKO – Institute e.v.	Germany
Jan van der Steen	Nuclear Research and Consultancy Group	Netherlands
Dr Walter Steininger	Forschungszentrum Karlsruhe	Germany
Prof Hywel Thomas	Geoenvironmental Research Centre, Cardiff University	United Kingdom
Dr Frantisek Woller	Radioactive Waste Repository Authority	Czech Republic

CHAPTER 2: PROJECT WORKSHOP AGENDA

2.1 Introduction

This chapter presents the project workshop agenda as was planned.

2.2 Workshop Agenda: Day 1

14.00 Host Welcome - Mr Duda (SURAO, Czech Republic)

14.05 Introduction – Hywel Thomas (UWC, United Kingdom)

14.15 European Commission's Perspective– Christophe Davies (Directorate General Research, Nuclear Fission and Radiation Protection. European Commission, Belgium)

15.15 Review of Education and Training across the EU and Associated Countries - Petra Blaser (ITC, Switzerland) & Peter Cleall (Cardiff University, United Kingdom)

16.00 Discussion of review and feedback

16.30 Proposal for implementing the recommendations of CETRAD and future Perspectives – Hywel Thomas and Alan Hooper (Nirex, United Kingdom)

2.3 Workshop Agenda: Day 2

09.00 Introduction to the Parallel Working Group Sessions – Peter Cleall

09.25 Parallel Sessions
Working Group 1 - Prototype Board with Alan Hooper as Chairman and Rapporteur
Working Group 2 - Providers' Forum with Neil Chapman as Chairman and Rapporteur

12.00 Final Plenary Session
Working Group 1: Summary and recommendations
Working Group 2: Summary and recommendations
General discussion

12.55 Workshop summary and wrap-up – Hywel Thomas

CHAPTER 3: PROJECT WORKSHOP MINUTES

3.1 Workshop participants

3.1.1 Chair: A Hooper on behalf of H Thomas (Cardiff University, United Kingdom)

3.1.2 Participants See Table 1 for full list of CETRAD project partners and delegates

3.1.3 Apologies: H Thomas, T Lieven (CEA, France), S Tzanova (TUS, Bulgaria), Mr. Duda (SURAO, Czech Republic)

3.2 Minutes of day 1

3.2.1 Host's Welcome

The day began with a warm welcome to Prague by F Wooler (National Correspondent of Czech Republic) on behalf of Mr Duda of SURAO. F Wooler outlined the Czech Radioactive Waste Community's willingness to assist with issues surrounding the CETRAD project and eagerness to work with the European Radioactive Waste community.

3.2.2 Introduction

The workshop began with the introduction to the CETRAD Project Workshop by A Hooper and forwarding of apologies from H Thomas, who was unable to Chair the event due to illness.

A Hooper thanked all National Correspondents and their partners for their important roles in the CETRAD project. A Hooper emphasised input required to produce a final report of the project and highlighted the role of the project as a stepping stone towards improving education and training in the area of radioactive waste management. A Hooper confirmed his role as facilitator of the feedback process and urged workshop attendees to participate actively over the coming two days.

3.2.3 European Commissions' Perspective

C Davies provided reflections on the CETRAD project's survey results, identified the role of the European Commission on education and training, presented details of the European Commission and Euratom programme on education and training, and ended with presentation of conclusions and recommendations. Presentation slides are available in Appendix A1 of this report.

3.2.4 Review of Education and Training

P Blaser and P Cleall presented the findings of the Review of Education and Training Needs and Capability Report (Deliverable 3). The presentation slides are presented in Appendix A2 at the end of this report.

3.2.5 The IAEA Network of Centres of Excellence in Training and Demonstrations in Underground Facilities

As an addition to the original agenda, JM Potier provided an overview of the IAEA Network of Centres of Excellence emphasising a possible synergy between the IAEA and European Commission to optimise resources through co-operation, and offered the project partners the opportunity to obtain feedback from the IAEA when drafting the proposal.

3.2.6 Discussion of review and feedback

Discussion of the review and feedback considered the recurring issues of scope and drivers for education and training in RWM.

- **Scope**

It was suggested that the long term storage of many types of waste is needed, thus consideration should be given to the broadening of the scope, particularly as CETRAD has considered a small community, with small demand and a high level of skills required.

- **Legislative drivers**

The fact that there are no legal drivers for education and training in radioactive waste management was raised as being a potential obstacle to achieving sustainability in the proposal as there is no driving force for stakeholders to participate. It was also commented that the key driver is from stakeholders wishing to have well educated and trained employees.

- **Mobility**

As a small number of people are to be recruited, and mobility of workers is a key objective of the commission, would any proposal comply with these requirements? It was suggested that the recognition of training should assist in mobility.

It was agreed that the Review of Education and Training Needs and Provision Report (Deliverable 3) would be circulated again to provide National Coordinators the opportunity to make any last changes to the data presented in the report. A deadline for return was set as 18th March 2005.

3.2.7 Proposal for implementing the recommendations of CETRAD and future perspectives

A Hooper presented a detailed overview of the outline proposal for implementing the recommendations of CETRAD and future perspectives. Discussion of the proposal considered the following points:

- **Scope and details of activities**

C Davies acknowledged that the proposal was orientated to focus towards training only. It was suggested that the proposal encompass both education and training. The specific operational activities of the proposed initiative would need to be outlined.

- **Centres of Excellence and accreditation**

The question of further definition of accredited centres of excellence of international standards was raised. It was suggested that there would have to be some sort of benchmark to work towards, for example ISO9001 has a strict training and development requirement. Few universities apply for ISO9001 as universities cannot fit into this – they use MScs as a benchmark.

A Hooper commented that the Management Board, Advisory and Executive would decide on accreditation and that the Board would also analyse and approve courses.

- **Changes to terminology**

Some small changes to the terminology used in the outline proposal were suggested, in particular "advice" instead of "influence" when referring to European Commission thinking.

- **European Nuclear Engineering Network (ENEN)**

It was agreed that further detail of ENEN would be helpful and Olivia Comsa agreed to provide a brief overview of ENEN at the beginning of day 2.

3.3 Minutes of day 2

3.3.1 European Nuclear Engineering Network

O Comsa provided a brief overview of ENEN where the main objectives are to:

- Deliver a European Master of Science in Nuclear Engineering
- Foster / strengthen the relationship with research laboratories, industry and regulatory bodies by involving them in nuclear academic education by offering continuous training.
- Promote exchange of students and teachers.
- Increasing the number of students by providing incentives
- Establish a framework for mutual recognition

A brief general discussion took place where some consideration was given on the integration of CETRAD into ENEN.

It was suggested the NEPTUNO database would be useful to CETRAD.

M Hugi commented that the NEPTUNO initiative developed courses accepted by partners and agreed mutual recognition from the start.

N Chapman queried what was the balance between levels of resources going into training and education. O Comsa responded that the framework allows all courses and that ENEN is open to all university and research institutes.

3.3.2 Parallel working group sessions, workshop summaries and recommendations

The workshop was then split into a parallel session of two working groups where Working group 1 gave consideration to the Prototype Board with Alan Hooper as Chairman and Rapporteur. Working group 2 considered the Providers' Forum with Neil Chapman as Chairman and Rapporteur. The key issues considered were:

Working Group 1: Prototype Board

- Governance
- National Correspondents
- National networking
- Scope (technical)
- Education and Training Needs
- Who receives education and training
- Funding
- Topics

Working Group 2: Providers Forum

- Who are the providers?
- What benefits could we deliver by working together?
- How could the Providers Forum help with accreditation?
- What would the Providers Forum expect from the Management Board?
- What would the Providers Forum expect from the Executive?
- How would the Providers Forum work?
- Who will be on the providers group?

3.3.2.1 Working Group 1: Prototype Board

Overall, the Working Group found that good education and training exists. Key issues to receive further consideration involve coordination and communication and accreditation. The group reaffirmed a commitment to take the next step and further develop CETRAD to address the needs identified within the survey. It was found that course content and the delivery involved in next steps is to be evaluated.

Issues considered and discussed by the Working Group are identified below:

i. Governance
This issue of the structure of the initiative was discussed, this started from a point of agreement on acceptance of the proposal detailed in Chapter 3. The main concern was with how strongly the initiative should be linked to other initiatives, for example ENEN.
   - It was agreed that an action would be taken by A Hooper to resolve this issue via discussion with National Correspondents.

ii. National Correspondents
The issue of who the national correspondents should be was debated. It was concluded that the current individual should be retained in the short term and, if changes were needed, this could be done after the new initiative was established, this was felt to be the best mechanism to ensure continuity.

iii. National networking
How national networks could be developed to ensure wide acceptance and participation at a nation level was identified as a key issue.
- Olivia Comsa agreed to coordinate input on this subject.

iv. Scope (technical)
The technical scope is currently focused on geological disposal of radioactive waste.
- It was proposed that the technical scope be developed further by M Palmu (Posiva, Finland)

v. Education and Training Needs
A general discussion was held discussing i) how best to utilise Masters course structures, ii) Specific training requirements (see topics) and iii) how to integrate non-university provision.

vi. Who receives education and training
It was concluded that anyone who has interest / is involved / wishes to achieve further qualification should be able to receive any provision made available.

vii. Funding
It was agreed that funders must be confident of quality.

viii. Topics
A list of specific training topics was identified as being a key requirement for the next stage.
- It was agreed that A Hooper would develop this with National Correspondents and review as a starting point.

3.3.2.2 Working Group 2: Providers' Forum

The Working group identified and discussed a number of topics identified below.

i. Who are the providers?

The group acknowledged that they represented a small sample of education and training providers. Providers were identified as:
- Universities
- Specific Training Organisations
- Research Institutes
- Waste management industry organisations
- Commercial / consultancy provision
- EC integrated projects are also providers

It was acknowledged that some organisations have a dual role as user and provider and in-house training does involve cooperation between universities and in-house training providers.

ii. What benefits could we deliver by working together?

With regard to education, working together was identified as enabling:

- Communication as a minimum,
- Recognition of providers and courses across Europe,
- The mobility of participants

With regard to education and training, working together was identified as enabling:

- Interdisciplinary capability of providers,
- Flexibility of providers to respond to user needs,
- A combined capability that one provider alone could not supply, and a broad pool of expertise is achieved through collaboration
- Direct collaboration between academic and non academic providers

Benefits of providers working together with other providers were also identified. These include:

- Greater ability to attract excellent students
- Some guarantee of continuity and use
- A common perspective

Overall, it was noted that education and training providers have the capability to provide what is required by users.

iii. How could the Providers' Forum help with accreditation?

Accreditation with regard to academic courses was discussed:

- It was questioned whether uniformity across Europe would be achievable and noted that to guide users may be more achievable. It was agreed that accreditation assists in making courses, content etc comparable.
- It was acknowledged that the European Credit Transfer Schemes (ECTS) are currently being used for university Quality Assessment and the possibility of developing CETRAD to be a recognised accreditation brand.
- The use of established accreditation initiatives such as European Nuclear Engineering Network (ENEN) and Erasmus Mundus were suggested as alternatives.

With regard to accreditation of non academic courses, the Working Group discussed the following:

- The creation of a diploma with CETRAD branded accreditation.
- Comprehensive description of courses' content.
- The provision of information to universities who may use these courses as modules.
- The comparison of the Erasmus Mundus process.
- Consideration to the training level with respect to lifelong learning and future formalised European education systems.

iv. What would the Providers' Forum expect from the Management Board?

The Providers Forum identified the following expectations of the Management Board:

- Clear guidance, clear programmes and continuity
- Adequate preparation time of 3 year cycles
- Task perspectives
- The specification of format of delivery such as guidance on course length, guidance on value of distance learning, guidance on practical learning.
- Views from users on their requirements for testing and examination
- Estimates of market size (as a guarantee of participant numbers).

v. What would the Providers' Forum expect from the Executive?

The Providers' Forum identified the following expectations of the Executive:

- The marketing of courses
- A database of provision specifying courses and course content
- Where necessary for efficiency liaison between course participants and providers; the checking of student credentials and background, and financial management.
- Secretariat support for the Providers' Forum

vi. How would the Providers' Forum work?

It was identified that the Providers' Forum:

- Would respond to board requirements communicated through an annual meeting and seminar considering the key issues.
- Could act as a core group representative of different types of providers.
- Be a part of an organised open network
- Be elected from the providers by the providers forum
- Could liaise with the broader providers group to ensure mutual agreement of aims and objectives.
- Representative of the Providers' Forum could sit on the advisory group

vii. Who will be on the Providers' Forum?

It was agreed that the Providers' Forum would be open to all providers.

A reporting session was then held where the working group Chairmen presented the outcomes of the session. These reports constituted of presentations which were provided in Appendices A5 and A6 for working group 1 and working group 2 respectively. It was agreed that these presentations represented the outcomes of the groups' work.

3.3.3 Workshop summary and wrap up

A final workshop summary and wrap up was given by A Hooper. He concluded that agreement had been reached to develop an initiative in the area. This would allow the driving forward of the main objectives of the stakeholders represented in the CETRAD project and at the workshop. A set of future actions were identified:

- Details of proposal to be resolved
- Assistance required from colleagues to create proposal – Working group 2
- A Hooper to provide a timetable of the scheme and executive summary format of proposal
- Actions on individuals as an outcome of Working group 1:
    - A Hooper to resolve governance issues via discussion with National Correspondents
    - O Comsa to coordinate input on how national networking should be done
    - M Palmu to propose technical scope

A Hooper thanked everyone for participating and the workshop was brought to a close.

CHAPTER 4: CONCLUSIONS

This report has provided the agenda and minutes of the CETRAD Project Workshop (Deliverable 7). The workshop afforded stakeholders and CETRAD partners the opportunity to provide feedback on the findings of the CETRAD survey and on the resulting education and training proposal, thus enabling further development of the proposal.

APPENDIX A : WORKSHOP PRESENTATIONS

A1 European Commissions' Perspective– Christophe Davies (Directorate General Research, Nuclear Fission and Radiation Protection. European Commission, Belgium)

CETRAD workshop on education & training in radioactive waste management
Prague, 9-10 March 2005

Education and training (E&T) in the management and disposal of radioactive waste in Europe

« European Commission's perspective »

Christophe Davies
DG Research
Unit J/4, Nuclear Fission & Radiation Protection

Overview

1. Background
2. Reflections on CETRAD's survey results
3. Role of European Commission in E & T
4. EC and Euratom programme on education & training
5. Conclusions/recommendations

1. Background

- Education & lifelong learning: central to EC policy
  - ➢ for growth and economic development in EC treaty
  - ➢ and for the continued safe use of nuclear energy in Euratom treaty.
- *« How to maintain nuclear competence in Europe »*, a great concern indentified in EC report EUR 19787, and by IAEA and OECD/NEA.
- CETRAD to contribute to road map to meet identified needs.

2.(1) Reflections on CETRAD's survey results

- Answers to questionnaire and report on needs & provisions:
  - ➢ found comprehensive and representative of:
    - EU Member States and associated states (17),
    - end-users of training (160 organisations surveyed),
    - capabilities, activities and facilities for the provision of E&T (66 university courses and 16 non-university organisations),
    - current and future requirements for staff training and education levels,
  - ➢ involvement of partners experienced in education and training a plus.
  - ➢ data gathered looks sound and sufficient basis to propose relevant strategy.

2.(2) Reflections on survey results

- Staff numbers and education profiles:
  - ➢ ~3600 specialist staff in radioactive waste management (RWM) and nuclear industry organisations, and regulatory and government organisations in RWM,
  - ➢ profiles: generally minimum engineer, MSc, PhD and above but also technical qualifications,
  - ➢ age range: 30 to 50 with gap above 50: concern for training aspect ?,
  - ➢ several legal requirements for qualification in radiation protection & nuclear safety.

2.(3) Reflections on survey results

- Training requirements:
  - ➢ Demand apparently met by offer both internally and externally on a wide variety of topics & in different ways:
    - technical staff: training assumed internally ?,
    - MSc and PhD: broad for new staff & mainly provided internally, specific externally on ad-hoc basis,
    - greatest demand for training in radiation protection & safety assessment (RP & SA),
    - National training provisions in place for radiation protection & nuclear safety when legal requirements.
  - ➢ need to structure training offer at EU level ?
  - ➢ need to provide new or standardised offer at EU level ?

2.(4) Reflections on survey results

- Recruitment forecast, education level & disciplines:
  - ➢ 200 additional staff in next five years,
    - higher numbers if National programmes take off,
    - increase possibly mitigated by staff reductions in some countries,
    - broad specialist disciplines needed: RP & SA, earth sciences & rock engineering, nuclear & chemical engin.,
    - minimum MSc, PhD a plus for contribution to research.
  - ➢ sufficient education facilities with accredited modules under Bologna process but lack of coordination,
  - ➢ low recruitment forecast & spectrum of disciplines make setting up of European master in RWM questionable?

2.(5) Reflections

- Needs for training of current staff is evident, but wide and diverse and no single answer,
- Education and qualification levels needed for future recruits are high, but market is small,
- PhDs can make significant contributions to research but «they are few and far between».

➢ multiple strategy line to address multiple market needs likely to be the only solution to improve situation.

3.(1) Role of EC in E&T

- Generic level:
  - ➢ foster competitiveness- & continued safe use- of nuclear energy via research and E&T policy objectives,
  - ➢ keywords: quality, mutual recognition & mobility of students and scientists,
  - ➢ provide plain level field for E&T actors and respect competition rules,
  - ➢ organise education offer to attract more students in RWM disciplines.

3.(2) Role of EC in E&T

- In practice could be provide initial help for the stakeholders in:
  - ➢ setting up, management and secretariat of network of users and providers of training,
  - ➢ structuring/integrating and co-ordinating supply of E&T in Europe,
  - ➢ development and implementation of recognition & accreditation of teaching & qualifications across Europe,
  - ➢ development of curriculum for accredited E&T courses.

3.(3) Role of EC in E&T

- In practice EC financial support not meant to:
  - ➢ develop content of E&T courses and study material,
  - ➢ become permanent beyond initial phase, following which stakeholders to take over.

4.(1) EC programme on E&T

- EC programme:
  - ➢ Erasmus Mundus scheme: support to courses at masters level leading to recognised diploma, http://europa.eu.int/comm/education/index_en.html
  - ➢ Marie Curie actions: training & mobility for researchers undertaking PhD degree & post Doc., http://europa.eu.int/comm/research/fp6/mariecurie-actions/action/level_en.html
  - ➢ The Researcher's Mobility Portal: http://europa.eu.int/eracareers/index_en.cfm

4.(2) **EC programme on E&T**

- Euratom FP6 (2002-2006) programme:
  - Programme area: fixed call, other activities
    - last call spring 2005, deadline October 2005,
    - co-ordination action(s) in E&T on *"Harmonisation of nuclear E&T schemes across EU in reactor safety, RWM and RP",*
    - ~13m€ total budget for areas: Innovative concepts, E&T, Safety of existing nuclear installations and cross-cutting activities,
    - Large competition expected.

4.(3) **EC & Euratom programme on E&T**

- Euratom FP6 (2002-2006) programme:
  - programme area: open call
    - deadlines: April & October 2005, April 2006,
    - actions to *"promote and develop human resources and mobility"*: training fellowships and European re-integration grants, Special training courses, Grants for co-operating with Third Countries,
    - ~1.5m€ per cut-off date for above actions + other specific support actions and Trans-national access to large infrastructures .
  - consult: www.cordis.lu/fp6-euratom/library.htm

5.(1) **Conclusions**

- CETRAD's survey:
  - results sufficient to make relevant proposal,
  - prospect for employment in RWM is modest, but qualification levels needed are high MSc & PhD. This may call for specific university courses and doctoral school rather than a full European Master in RWM,
  - training is needed, but again in different ways and forms. Co-ordination and accreditation of courses in disciplines / topics of common interest and where there are National legal requirements might be beneficial,
  - addressing only part of the above, probably insufficient to make substantial contribution to the needs identified.

5.(2) **Recommendations**

- A truly pan-European effort should tackle the three main needs identified:
  - MSc specific courses, PhD doctoral school and structuring/integration and co-ordination of courses and supply of E&T in Europe,
  - given small size of RWM community, a future initiative would advantageously benefit from experience developed by the ENEN «European Nuclear Education Network» in developing accredited curriculums and courses if it joined the consortium.

5.(3) **Recommendations**

- An integrated pan-European effort could consider:
  - development of courses combining ECTS accreditations for students and training for professionals,
  - close co-ordination of efforts between E&T network activities and the E&T and dissemination activities part of the Integrated projects funded under current and future Euratom research programmes,
  - the activities to be undertaken by a potential proposal for support by the Euratom programme should be clearly detailed for maximum chances of success at evaluation stage,
  - a first practical example of a E&T course is expected at the end of the project as product of CETRAD.

A2 Review of Education and Training across the EU and Associated Countries

Review of Education and Training

Ms Petra Blaser, ITC School of Underground Waste and Storage Disposal
Dr Peter Cleall, Geoenvironmental Research Centre, Cardiff University

GRC ITC

Project Objectives

- Aim: To assess the current situation of education and training in radioactive waste management focusing on geological disposal
- Objectives:
  - To review current (and future) needs and provision of education and training
  - To develop proposals and options to address these needs

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International and European Initiatives (1)

International Initiatives:

- ITC School of Underground Waste Storage and Disposal
  (49 members from 14 countries, RWM courses since 2003)
- The World Nuclear University
  (members from 27 countries, first summer school on nuclear energy planned in 2005)
- IAEA Network of Centres of Excellence (CEO) for Training in and Demonstration of Waste Disposal Technologies in Underground Research Facilities
  (6 members from 6 countries, 6 URL facilities)

GRC ITC

International and European Initiatives (2)

European Initiatives:

- ACTINET 6: Network of Excellence for Actinide Sciences “Partitioning and transmutation and other concepts to produce less waste in nuclear energy generation”
- EURAC: “Securing European radiological protection and radioecology competence to meet the future needs of stakeholders”
- EUNDETRAF II: “European Nuclear Decommissioning Training Facility”
- NF-Pro: “Understanding and physical and numerical modelling of the key processes in the near-field and their coupling for different host rocks and repository strategies”
- NEPTUNO: “Nuclear European Platform of Training and University Organisations”
- ENEN: “European Nuclear Engineering Network”
- BNEN: “Belgian Nuclear Higher Education Network”
- PETRUS: “Programme for Education, Training and Research on Underground Storage”
- CETRAD: “Coordination Action on Education and Training in Radiation Protection and Radioactive Waste Management”

GRC ITC

CETRAD Participants

Studiecentrum voor Kernenergie, Centre d'Etudes de l'Energie Nucléaire
Kozloduy NPP Plc
Technical University of Sofia
Správa úložist radioaktivních odpadu
Posiva Oy
Commissariat à l'Energie Atomique
Forschungszentrum Karlsruhe
Public Agency for Radioactive Waste Management
Ente Nazionale per le Nuove Tecnologie, l'Energia e l'Ambiente
Nuclear Research and Consultancy Group
Instituto Technológico e Nuclear
Centre of Technology and Engineering for Nuclear Projects
DECOM Slovakia, spol. s r.o.
Agency for Radwaste Management
Universidad Politecnica de Madrid
Svensk Kaernbraenslehantering AB
National Cooperative for the Disposal of Radioactive Waste
ITC School of Underground Waste Storage and Disposal
Nirex Ltd
Geoenvironmental Research Centre, Cardiff University

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Current Status of CETRAD

- National Surveys completed by National Correspondents
- Analysis and synthesis of results performed
- Report “Geological Disposal of Radioactive Waste: Review of European Education and Training Needs and Capability” prepared
- Conclusions and recommendations of this workshop will be incorporated into this final report under future plans and proposals

GRC ITC

Review of educational & training needs and capabilities

- Data from 17 states within European Union and Associated Countries
- National Correspondents responsible for gathering national level data
- Training needs of:
  - National radioactive waste management organisations
  - Regulatory and government organisations
  - Other nuclear industry organisations employing staff in this area
- Education and training provision:
  - Universities
  - Non-university organisations

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National Surveys

Questions to National Correspondents:

- First Questionnaire with information note: Prepared and sent by 12. February 2004 (deadline: 23. April 2004)
- Complementary Question Set: Sent by 26. July 2004 (deadline: 20. August 2004)
- NC specific questions for clarification of National Surveys: Sent by 27. July 2004 (deadline: end of August 2004).
- Short Supplementary Question Set to help identify principal conclusions: Sent by 10. December 2004 (deadline: 13. January 2005)

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Quality of received information

- Information is very heterogeneous and contains a large quantity of data (difficult to represent data graphically and to perform statistics), provision of qualitative statements abundant
- Gaps in National Surveys were encountered (e.g. quantitative data about future additional staff)
- Subjectivity issues regarding terminology and interpretation of questions (e.g. definition of specialists / generalists and their qualifications seemed unclear)
- Differences in national structures and perceptions (e.g. education system, different professional levels)
- Different programme stages and large uncertainties made the prediction of future needs difficult in some cases

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Review of Education and Training

National overviews

Results and analysis
- Education and Training Needs
  - National RWM organisations
  - Other nuclear industry organisations
  - Regulatory and government advisory organisations
- Capabilities and Activities
  - Non university organisations
  - Universities
- Summaries
- Conclusions

GRC ITC

Timescale of National Programmes

Each national programme has a different repository development timescale:

- Earliest: 2020 (Finland)
- Some countries have no programmes (e.g. United Kingdom, The Netherlands)
- Very wide range from definite to indefinite
- Involves large uncertainties
- Some countries have operating URLs, some countries plan URLs

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Timescale of National Programmes

Important milestones:

Country	URL	Repository Development Programme or UGR operation date
Belgium	Present	
Bulgaria		2012
Czech Republic		2065
Finland	2004-2012	2020
France	Present (2004)	No agreed timescale
Germany	No agreed timescale	2030
Hungary	2013	2033-2046
Italy	No agreed timescale	2008 (date under review)
Netherlands	No agreed timescale	No agreed timescale
Portugal	Timescale not known	Not known
Slovak Republic	No agreed timescale	2006-2037
Slovenia	No intentions to construct	2066
Spain	No intentions to construct	Postponed
Sweden	Present	2006-2017
Switzerland	Present	2010-2040
UK	No intentions to construct	No agreed timescale

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National Overviews – General Findings

- Fall in RWM experts (MSc +) due to staff retirement (generation gap)
- Future specialist staff needs are related to phased national programme implementation
- No or ill-defined national long-term strategy for E&T in RWM (except Bulgaria, The Netherlands)
- No strong legal requirements for E&T in RWM
- E&T is generally provided by: on-the-job training, in-house & external courses (university, non-university), international conferences & workshops
- Strong demand for training in RWM within Europe

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National Overviews – Some specific Features

Examples:

- Belgium: RWM E&T Networks (ENEN, BNEN) & partnerships with industry
- UK: Three national incentives to coordinate & improve E&T in RWM (COGENT, Project Dalton, NTEC)
- Czech Republic: Siting process suspended in 2004
- France: University Master Degree (one year), PETRUS initiative
- Germany & Slovak Republic: No RWM organisation, uncertain situation concerning future strategy
- Hungary: No E&T facilities available for RWM at the moment
- Portugal: E&T in RWM is regarded as not satisfactory
- Slovenia: Difficult to recruit specialist staff in RWM within country (generalists have to be employed) and to transfer knowledge to younger generations
- Switzerland: ITC provides courses in RWM, URLs (crystalline and claystone) offered; further European wide opportunities for E&T may be useful but not indispensable for the sake of HR in RWM

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National RWM Organisations (1 of 5)

- Well established organisations
- All countries have national RWM organisations:
  - Except Germany
  - Slovak Republic currently being established
- Average of 60 specialists per country employed by national RWM organisations
- 'Specialist' all RWM staff excluding administrative and support staff

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National RWM Organisations (2 of 5)

Country	Specialist staff	Country	Specialist staff
Belgium	34	Bulgaria	147
Czech Republic	18	Finland	32
France	195	Germany	---
Hungary	13	Italy	100
Netherlands	39	Portugal	5
Romania	15	Slovak Republic	85
Slovenia	13	Spain	110
Sweden	85	Switzerland	49
United Kingdom	39		

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National RWM Organisations (3 of 5)

- Specialist staff typically have post-graduate education
- Aged 30-50
- Broad RWM training required
  - Wide variety of subjects
  - Directly and indirectly applicable to RWM and geological disposal
- Specialist areas of specialist staff currently employed
  - Nuclear and chemical engineering
  - Radiation protection and safety assessment
  - Earth sciences and rock engineering
  - Plus a few in public relations and communications
- Employment of specialist staff peaked, not expected to increase significantly (unless national RWM programmes are activated)

GRC ITC

National RWM Organisations (4 of 5)

- Training methods utilised
  - Training courses
  - Conferences
  - Seminars and international collaborative meetings
  - On-the-job training
- Education and training is provided internally and externally

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National RWM Organisations (5 of 5)

- Typical courses identified:

Provided Internally	Externally Sourced
Collection & classification of wastes	Radiation protection
Use of equipment to monitor radiation / contamination	Design & construction of URL and repository
Waste characterisation	Site selection
Work safety	Quality Assurance
Radiation protection at NPP	Health Physics
RTD programs	Law, regulation and standards
Quality Assessment	Environmental protection
Facility design	Safety

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Review of Education and Training

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GRC ITC

Other Nuclear Industry Organisations (1 of 3)

- Public and private organisations employing staff in RWM:
  - Contractors
  - Consultants
- Varied RWM responsibilities :
  - Transport, treatment, processing, storage of waste
  - Decommissioning activities
  - General participation in RW projects
- Specialist staff typically posses technical qualifications
- More staff employed with technical qualifications rather than PhD level
- Definition of specialist varies from country to country

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Other Nuclear Industry Organisations (2 of 3)

Country	Organisations	Specialist staff	Country	Organisations	Specialist staff
Belgium	3	55	Bulgaria	2	---
Czech Republic	1	15	Finland	5	1-15
France	1	400	Germany	8	12-250
Hungary	0	---	Italy	2	6-30
Netherlands	4	6-53	Portugal	0	---
Romania	8	50-250	Slovak Republic	1	28
Slovenia	2	9	Spain	6	1-82
Sweden	1	---	Switzerland	several	---
UK	1	250			

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Other Nuclear Industry Organisations (3 of 3)

- Legal requirements generally relate to nuclear safety and radiation protection
- Regulations do not impose set levels of education and training
- Education and training developed to organisational requirements
- Specialist areas of currently employed specialist staff
  - Nuclear and chemical engineering
  - Radiation protection and safety assessment
  - Earth sciences and rock engineering

GRC ITC

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GRC ITC

Regulatory and Government Advisory Organisations (1 of 4)

- Most countries have at least 1 regulatory body and one or more government advisory organisations
- Many government advisory organisations also have some research capacity

GRC ITC

Regulatory and Government Advisory Organisations (2 of 4)

Country	Regulatory	Advisory	No. of Specialist Staff
Belgium	1		67
Bulgaria		1	6
Czech Republic	1		4
Finland	2	8	3 - 23
France	1 unspecified		
Germany		6	10 - 100
Hungary	1		7
Italy	1 regulatory & advisory		10
Netherlands	1	1	2.5 - 15
Portugal	2 unspecified		
Romania	2 unspecified		
Slovak Republic	2		4 - 7
Slovenia	2	1	2.5 - 60
Spain	1		32
Sweden	2	1	14 - 23
Switzerland		3	10
United Kingdom	1		4

GRC ITC

Regulatory and Government Advisory Organisations (3 of 4)

- Specialist staff typically posses PhD and MSc qualifications
- No extensive legislative demand for education and training
- Specialist areas of currently employed specialist staff
  - Nuclear and chemical engineering
  - Radiation protection and safety assessment
  - Earth sciences and rock engineering
- Broad introductory training obtained internally
- Specialised / focused training obtained externally

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Regulatory and Government Advisory Organisations (4 of 4)

- Training methods utilised
  - Courses
  - Conferences and seminars
  - Workshops
  - Summer schools (e.g. ITC)
- On-the-job training is used by many
- Regulatory and government organisations send staff overseas more than national RWM organisations and other nuclear industry organisations

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GRC ITC

Future Demand (1 of 3)

- 200 specialist staff educated to MSc level required over next 5 years

Country	Numbers of staff	Qualification level
Bulgaria	15	
Czech Republic	8	MSc
Czech Republic	18 (replacement)	PhD & MSc
Finland	30	MSc or higher
France	40-55	
Italy	40	Engineering
Netherlands	2	MSc
Portugal	7	
Netherlands	2	MSc
Portugal	7	Not identified
Slovak Republic	3	MSc
Spain	5-10 +	MSc minimum
Slovenia	20 (replacement)	University Diploma
Switzerland	10	MSc or higher
Sweden	7.5	MSc
UK	6	MSc or higher

GRC ITC

Future Demand (2 of 3)

- Additional recruitment and natural replacement dependent on unforeseeable factors:
  - National RWM programmes
  - Political developments and decisions
  - Economic position
  - Development of R&D budgets
- Specialist areas currently in greatest demand and will continue to be in demand are:
  - Radiation protection and safety assessment
  - Nuclear and chemical engineering
  - Earth sciences and rock engineering

GRC ITC

Future Demand (3 of 3)

National levels of demand for RWM training

Country	Level of demand
Czech Republic	High
Spain	High
Finland	High to medium
France	Medium
Netherlands	Medium
United Kingdom	Medium
Switzerland	Medium to low
Slovenia	Medium to low
Portugal	Medium to low
Belgium	Medium to low
Hungary	Low

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Additional Considerations: Social Acceptance

- Public opinion and social inclusion issues increasingly important
- Related to achieving social and political acceptability of geological disposal
- Programmes established to address such issues in:
  - Spain
  - Belgium
  - Sweden
  - Switzerland

GRC ITC

Summary of Education and Training Needs

- 3600 specialists employed
- Organisations expect to recruit minimum of 200 specialists during next five years.
- Sharp upturns expected when milestones of URLs and repository construction are approached
- No strong legislative drivers for education and training in radioactive waste management
- Confirmation of a generation gap – cause for concern
- Public relations and social issues a growth area

GRC ITC

Summary of Education and Training Needs

- Current and future demand for specialists in:
  - Nuclear and chemical engineering
  - Radiation protection and safety assessment
  - Earth sciences and rock engineering
  - PR and communications a growth area
- Employers don't identify need for specific RWM MSc but this may be because it has never been available
- Demand for PhDs not high
- Each of the 160 organisations surveyed considers training to be required
- Strong need for provision of training

GRC ITC

Review of Education and Training

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GRC ITC

Non-university Organisations (1 of 3)

- Both private and state organisations
- Available in most countries
- 15 non-university organisations identified
- Provision is generally
  - Broad
  - Various levels
  - Short
  - Stand alone courses
- No distance learning courses identified

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Non-university Organisations (2 of 3)

- Non-university training providers

Country	Organisation
Belgium	isRP
Netherlands	NRG
Portugal	ITN
Slovenia	Jozef Stephan Institute
	NPP Krisko Training Department
Germany	FTU of FZK
Bulgaria	Personnela Training Centre, Kozloduy NPP
Finland	JP-Finact and JP-Suoraplan
	VTT Processes
Slovak Republic	NPP Personnel Training Centre VUJE
Switzerland	ITC
	Strahlenschutzschule
	Reaktorschule
France	INSTN
Spain	CIEMAT

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Non-university Organisations (3 of 3)

- Mostly professional training
- Some work with academia
- Some linked to industry to access facilities
- Demand dependent
- Customised services to meet client specific needs
- Largely uncoordinated and disjointed

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GRC ITC

Universities (1 of 3)

- 66 university courses involving RWM
- RWM considered by numerous disciplines at first degree and MSc level
- RWM modules within broad courses
- Only 1 proposed MSc course wholly dedicated to RWM
- PhD level research programmes

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Universities (2 of 3)

Examples of Courses:-

Country	Provider	Course Name
Belgium	Belgian Nuclear Higher Education Network (BNEN)	Interuniversity programme in Nuclear Engineering University degree for the complete BNEN
Slovenia	University of Ljubljana	Graduate programme in Nuclear Engineering Master degree in Nuclear Engineering
Germany	Technical University Clausthal, Institute of Mining	Lecture: Long-term safety of waste repositories Lecture: Disposal of hazardous waste
Czech Republic	Czech Technical University	Experimental Research of Nuclear Waste Disposal
Sweden	Chalmers University of Technology	Nuclear Chemistry: course of 3 lectures, 2 hours involves nuclear waste PhD courses: contain 4 weeks of lectures in SA of geological repositories plus project work

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Universities (3 of 3)

- No distance learning courses identified
- No data related to graduate progression into employment
- Universities have sufficient facilities and access to industrial facilities
- Accreditation via Bologna process, some courses linked with ENEN

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Overview of Infrastructure: URL Facilities

- Sufficient facilities available
- Future development dependent on political decisions to be taken (e.g. UK)
- Sharing schemes
  - UK
  - Netherlands
  - Switzerland
  - France
- Czech Republic and Hungary have none at present but anticipated

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Summary of Education and Training Provision

- Non-university training provision:
  - At all levels
  - Short stand alone courses
  - Demand dependent – often run infrequently
  - External training needs met by this mechanism
  - Largely uncoordinated and unaccredited
- University education provision:
  - Numerous disciplines and majority of capability
  - Typically modules within broader courses
  - Just 1 course dedicated to RWM
  - PhD level research programmes

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Review of Education and Training

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GRC ITC

Conclusions: General

- Review via National Correspondents
- 3600 RWM specialist staff employed
- Minimum of 200 specialist staff to be recruited over 5 years
- If national RWM activated, numbers are expected to sharply increase
- Confirmation of a generation gap – cause for concern
- No strong legislative drivers for RWM (as in Radiation Protection)

GRC ITC

Conclusions: Education Requirements

- Staff with expertise are currently utilised and will continue to be required:
  - Nuclear and chemical engineering
  - Radiation protection and safety assessment
  - Earth sciences and rock engineering
- PR and communications is a growth area due to importance of social acceptability
- New and replacement staff educated to MSc and PhD level are required
- If upturn takes place numbers will increase

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Conclusions: Training Requirements

- Strong demand for internally and externally sourced training provision
  - Over 3600 specialists requiring continuous professional training
- On the job training is common practice enabling transfer of tacit knowledge and experience of older generations

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Conclusions: Education Provision

- Education provided by 66 universities
  - MSc level
  - Modules of general courses
  - Accreditation Bologna Process
  - PhD level via research programmes
- 1 Proposed MSc course dedicated to RWM (Germany)
- PhDs market driven by research investors
- Sufficient large scale facilities available
- Absence of co-ordination of education needs and provision at European Level

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Conclusions: Training provision

- Training provision achieved via
  - On the job
  - Courses internal to employer organisations
  - External courses
  - Conferences and seminars
- External courses provided by 16 non-university organisations – needs currently met by this mechanism
- Further provision will be demanded if upturn in activity
- Absence of:
  - Mechanisms to allow recognition and accreditation of training provided
  - Co-ordination of training needs and provision at a European level

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Recommendations

- Introduction of a mechanism to co-ordinate education needs and provision at a European level
- Introduction of mechanisms to:
  - Allow recognition and accreditation of training provided
  - Co-ordinate at a European level training needs and provision

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A3 The IAEA Network of Centres of Excellence in Training and Demonstrations in Underground Facilities

The IAEA Network of Centres of Excellence in Training and Demonstrations in Underground Research Facilities

J-M. Potier
Section Head
Waste Technology Section

IAEA

Programme L. MANAGEMENT OF RADIOACTIVE WASTE

Project L.4.02 : Building confidence in geological disposal of radioactive waste

- **Establish a Network of Centres of Excellence and develop Network related activities (training, co-ordinated research programmes, fellowships and scientific visits)**
- **Contribute to increasing the acceptance of geological disposal concepts through demonstration activities in underground research facilities**

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NETWORK OBJECTIVES

- **Encourage the transfer and preservation of knowledge among IAEA Member States**
- **Supplement national efforts and promote public confidence in waste isolation**
- **Contribute to the resolution of key technical issues in geological disposal**
- **Provide for capacity building of IAEA MSs**

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NETWORK ORGANIZATION

The IAEA Network of Centers of Excellence consists of

- **Network Members, owners or operators of underground and/or surface research facilities, and**
- **Network Participants**

willing to share co-operative activities in training in and demonstration of waste geological disposal technologies

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NETWORK MANAGEMENT

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U / G RESEARCH FACILITIES – NETWORK MEMBERS

- **Belgium – EURIDICE / HADES URL, Mol**
- **Canada – URL, Lac du Bonnet**
- **Sweden – URL, Aspo**
- **Switzerland – URL Grimsel & Mont Terri**
- **USA – Yucca Mountain Project & WIPP**

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SURFACE RESEARCH FACILITIES – NETWORK MEMBERS

- Sweden – University of Kalmar
- UK – Geo-environmental Research Center, Cardiff University, Wales
- USA – Lawrence Berkeley National Laboratories University of California
  - associated with Underground Facilities
  - allow for Academic Training, Fellowships and Scholarships

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NETWORK ACTIVITIES – 2003 ACHIEVEMENTS

- North American Training Course
  General Training on Methodologies for Geological Disposal
  Hosts: LBNL + Yucca Mountain (USA), URL (CAN).
  Recipients: ARG, CHI, BRA, KOR, IND, SAF, CZR, MEX.
- European Training Course
  Methodologies for Geological Disposal (Fundamentals, Theory and Practice)
  Hosts: ITC + NAGRA (CH), SCK/CEN + ESV Euridice (BEL)
  Recipients: ARM, BUL, CRO, CZR, HUN, IND, LTU,ROM, RUS, SVK, SLO, UKR.

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NETWORK ACTIVITIES – 2004 ACHIEVEMENTS

- North American Training Course
  General Training on Methodologies for Geological Disposal
  Hosts: LBNL + Yucca Mountain (USA), URL (CAN).
  Recipients: ARG, ARM, BUL, CZR, HUN, LIT, ROM, RF, SAF, SLK, SLO, UKR
- European Training Course
  Site Selection Procedures and Methodology (CZR) & the Fundamentals of Geological Disposal (CH)
  Hosts: CZR (4 days) + CH (NAGRA - ITC) (5 days)
  Recipients: ARG, ARM, CH, CPR, HUN, IND, LIT, PAK, PHI, RF, SLK, SLO, SAF

Fellowships

Disassembly of the Tunnel Sealing Experiment
Host: AECL – URL (CAN)
Recipients: CZR, SAF, UKR

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NETWORK ACTIVITIES - PROGRESS

Co-ordinated Research Programmes

- Swelling Clays as Engineered Barriers (led by SWE)
  - Applications invited 2002. Applications received from 28 Member States.
  - Contracts Awarded to CPR, CZR, RUS, KOR, SAF, UKR
  - Agreements awarded to BEL, CAN, IND and JPN
  - Meetings held November 2003 and Oct 2004
- Numerical Modelling (led by USA)
  - Programme approved.
  - Applications will be sought in the next few months.
  - Contracts and Agreement will be let late in 2005

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NETWORK ACTIVITIES – 2005 TRAINING PROGRAMME

- Decision Making and Stakeholder Involvement in Repository Development
  - Hosts: PURAM (Hungary); ITC (Switzerland);
  - Date: 2nd Quarter 2005
- Repository Design
  - Hosts: ITC/NAGRA (Switzerland); SCK/CEN (Belgium); SKB (Sweden)
  - Date: 2nd Quarter 2005
- Methodologies for Geological Disposal
  - Hosts: Lawrence Berkeley National Laboratory (LBNL); Yucca Mountain Project (USA)
  - Date: 4th Quarter 2005

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NETWORK ACTIVITIES – 2006 TRAINING PROGRAMME

- Integrated Modelling of Radionuclide Migration from RW Repositories to Geosphere and Biosphere
  - Hosts: ITC / NAGRA (Switzerland); SCK / CEN (Belgium); SKB (Sweden) Cardiff University (UK)
  - Date: 2nd Quarter 2006
- Fundamentals of High Level Radioactive Waste Disposal
  - Hosts: RAWRA (Czech Republic) ITC / NAGRA (Switzerland);
  - Date: 3rd Quarter 2006

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NETWORK ACTIVITIES – 2005-06 TRAINING PROGRAMME

- **Fellowships & Site Visits**

  These will be offered for underground work in accordance with opportunities as they rise in the participating organizations with underground facilities.
  Opportunities are expected to arise as major experiments are advanced.

- **Scholarships**
  - **Intended to meet some of the needs of the Agency's Knowledge Management programme.**
  - **University/Agency scholarships for advanced degree programmes will be established for younger scientists and engineers.**

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NETWORK ACTIVITIES – 2007 TRAINING PROGRAMME

- **Concepts of Underground Rock Facilities and Transport and Retardation Processes in Fractured Media**
  - **Host: ITC / NAGRA (Switzerland);**

- **Numerical Modelling of Subsurface Processes**
  - **Hosts: Lawrence Berkeley National Laboratory (LBNL); US DOE Yucca Mountain Project (USA)**

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CONCLUSIONS

- **The IAEA Network of Centres of Excellence activities address one of the Agency Statutory Functions**
- **The programme is well supported by the Donor Member States and is in high demand from the Recipient Member States.**

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There are increased expectations for the application of Nuclear Energy Systems in the 21st Century. For example The Republic of China has recently announced the construction of 23 new reactor systems over the next few decades. Other IAEA/UN Member States are considering similar expansions of there programmes. In this context, the purpose of the Network project can be stated as follows:

To bring together both technology holders and users to jointly develop understanding of the actions required to achieve the Agency's goals for the safe and sustainable applications of Nuclear Energy.

With respect to the Geological disposal of HLW,
The first phase of this project is to transfer knowledge gained by current technology holders to Member States with developing NE Programmes. The Network is the prime mechanism for this transfer.

Participation in the project is expected to benefit both donor and recipient Member States.

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Meeting Needs

- Provide research coordination
  Achieved through co-ordinated research projects.
- Support training
  Achieved through INT 9/173 – Training Courses, Fellowships, Group Training Activities
- Facilitate information exchange
  Achieved through INT 9/173 – Training Courses Fellowships, Group Training and Site Visits. Also CRP Activities eventually lead to direct exchange of information and documentation.
- Provide for collaboration on demonstrations
  Not yet clear how this can be achieved. Technical and Consultant's Meetings allow for discussion of possibilities.
- Preserve knowledge
  CRP activities, Scholarships and documentation all assist in meeting this requirement.

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Network Activities - Programme

Training 2005/2006

- **European & North American Training Courses**
  3 Training Courses in 2005, Hungary, Switzerland, USA
  Minimum of 2 Training Courses in Europe in 2006

- **Fellowships & Site Visits:** **These will be offered for underground work in accordance with opportunities as they rise in the participating organizations with underground facilities. Opportunities are expected to arise as major experiments are advanced. Currently, offers are from Sweden.**

- **Scholarships:** **Intended to meet some of the needs of the Agency's Knowledge Management programme. University/Agency scholarships for advanced degree programmes will be established for younger scientists and engineers.**

Emphasis shifted from 2003-4 programme from Generalities and Fundamental issues to questions of Siting and repository Design.

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Network Activities - Progress

Training 2004 – Technical Co-operation INT 9/173

- Visiting Fellows participating in the disassembly of the Tunnel Sealing Experiment. Feb – Apr.
  Host: AECL – URL (CAN)
  Recipients: CZR, SAF, UKR (Participants in Swelling Clays CRP)

- North American Training Course – General Training on Methodologies for Geological Disposal October 2004
  Hosts: USA - LBNL (5 days) + Yucca Mountain (2 days)
  Recipients: ARG,ARM,BUL,CZR,HUN,LIT,ROM,RF,SLO,SLK, SAF,UKR.

- European Training Course – Site Selection Procedures and Methodology (CZR) & the Fundamentals of Geological Disposal (CH). November.
  Hosts: CZR (4 days) CH (NAGRA - ITC) (5 days)
  Recipients: ARG,ARM,CH,CPR,HUN,IND,LIT,PAK,PHI,RF, SLO,SLK,SAF.

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A4 Proposal for implementing the recommendations of CETRAD and Future Perspectives

Proposals and Future Perspectives

Prof Hywel Thomas – Geoenvironmental Research Centre, Cardiff University
Dr Alan Hooper - Nirex Ltd, UK.

Introduction

- An outline proposal for implementing the education and training recommendations of CETRAD
- Establish an umbrella organisation (CETRAD) which will facilitate the delivery of European education and training in radioactive waste management to meet the needs of key stakeholders

Proposed Mission Statement

To create a stakeholder driven European education and training infrastructure for geological disposal in radioactive waste management

Proposed Objectives

The objectives of CETRAD:

- To meet European stakeholders strategic European education and training needs at the highest international quality. To be achieved by the use of accredited centres of excellence of international standard
- To coordinate the delivery of such needs via the linkage of providers and clients
- To ensure that the EC's fundamental objectives of quality, recognition and mobility are met
- To influence EC thinking and planning for future needs

Proposed Objectives

Objectives of CETRAD continued:

- To act as a knowledge management repository and to actively promote best practice in European Knowledge Management
- To promote European excellence in this area throughout the rest of the world and attract non-European students to the European courses
- Via the above mechanisms, promote European skill, expertise and technology transfer to provide a European competitive advantage in emerging world markets in this area

Organisation

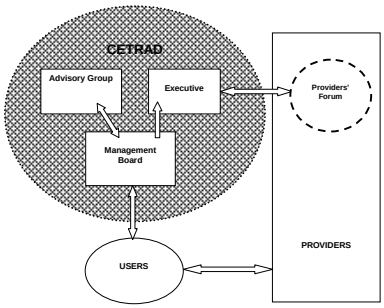
Main components of the organisation:

- A Management Board
- An Executive
- An Advisory Group

These three components will constitute CETRAD

Organisation

Proposed Structure of CETRAD organisation



Organisation Components

Management Board:

- National Correspondents representing key stakeholders requiring provision of education and training
- Responsible for all aspects of CETRAD's activities
- Key Task: to define education and training requirements
- Include representatives from ENEN and other key initiatives

Organisation Components

Executive:

- Responsible for implementing activities defined by Management Board
- Will report to the Management Board
- Primary interface with the Providers of education and training

Organisation Components

Advisory Group:

- Primary control and audit of quality
- Advise Management Board
- Experience in education, training / continuous professional development provision, e-learning and accreditation

Providers and Users

A Providers' forum:

- Area to meet
- Exchange best practice
- Provide feedback to CETRAD via Executive

Users

- Feedback
- Links via National Correspondents as national user representatives

The Way Forward

Green Light from NC's

	Support proposal	Support for Nirex to Chair board and lead EC proposal
Belgium	Yes	Yes
Bulgaria	Yes	Yes
Czech Republic	Yes	Yes
Finland	Qualified Yes - Number of concerns related to relationship with other initiatives and heavy nature of structure	Yes
France	No comments received	No comments received
Germany	Yes	Yes
Hungary	Yes	Yes
Italy	Yes	Yes (BUT dependant on ENEA future direction)
Netherlands	Yes	Yes
Portugal	Yes	Yes
Romania	Yes	Yes
Slovak Republic	Yes	Yes
Slovenia	Yes	Yes
Spain	Yes	Yes (from UPM only, not ENRESA due to state of flux)
Sweden	Yes	Yes
Switzerland	Yes	Yes

The Way Forward

So what next?

- Key point is to address issues raised by NC's during consultation and to develop details
- Working groups to develop details:-
  - WG1: Prototype Board – To identify requirements
    - » Identify specific requirements
    - » Explore proposals from stakeholders and user perspective
  - WG2: Providers Forum
    - » Identify specific delivery mechanisms
    - » Identify possible pilot studies
    - » Explore proposals from providers perspective

The Way Forward: Issues to consider

- Representation on the Board
- Identify scope
- Definition of E&T standards
- Alternative name
- Knowledge management

The Way Forward : Issues to consider

- Integration with other schemes
- Anticipate needs of key stakeholders
- Long term solution – delivery of users requirements over the lifetime of a national disposal programme
- Consider the different time schedules in the European RWM programmes
- Beyond Europe

Funding Structure

Long term goal: sustainable not-for-profit organisation

Submit proposal to EC to fund establishment

- Project Coordinator: Chair of Management Board
- Partners: Members of the Management Board
- Funding to finance:
  - Salary costs of Executive
  - Travel for Management Board and Advisory Group Members
  - Facilitation, organisation and logistics for Providers' Forum
- Timing: submit to FP6 Autumn 2005
- Project duration: 3 years minimum subject to negotiation with EC

Activities

Initial focus on training:

- Stand alone courses (e.g. ITC)
- Part of MSc courses
- On-the-job (mobility, recognition, accreditation)
- Conferences and seminars
- Those related to EC projects (e.g. IPs and objectives of FP7)
- Component parts of a broader training course

Activities

Executive to ensure education and training needs identified by the Management Board are addressed:

- Working with Providers of existing courses
- Development and delivery of new courses with established providers
- Direct development and delivery of courses
- Use of European Transfer Credit Scheme

A5 Working Group 1: Prototype Board - summary and recommendations

CETRAD

Co-ordination Action on Education and Training in Radioactive Waste Management

Workshop on Education and Training in Radioactive Waste Management

Workshop Structure: Day 2

- **Introduction to parallel working group sessions**
- **WG1: Prototype Board – Alan Hooper**
- **WG2: Providers' Forum – Neil Chapman**
- **Presentation and discussion of outcomes**
- **General discussion**

Working Group 1: Prototype Board

- **Alan Hooper Chair and Rapporteur**
- **Aim:**
  - **to identify specific requirements**
  - **explore proposal from stakeholder and user perspective**

Key findings

Good E&T provision exists

Key issues:-

- Co-ordination and communication
- Accreditation

Reaffirmed commitment to take next step

Course content and delivery involved in next step to be evaluated

Issues

Governance

- AH to resolve via discussion with NC's

National correspondents

National networking

- OC to coordinate input on how this should be done.

Scope (Technical)

- MP to propose

Issues

Education and training needs

- How best to utilize masters course structures
- Specific training requirements (see topics)
- How to integrate non university provision

Who receives the E&T

- Anyone who has interest / is involved / wishes to achieve further qualification.
- Funding
  - Funders must be confident in quality

Topics

- AH to develop with NC, Review as starting point

A6 Working Group 2: Providers' Forum - summary and recommendations

CETRAD

Co-ordination Action on Education and Training in Radioactive Waste Management

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Working Group 1: Prototype Board

- **Alan Hooper Chair and Rapporteur**
- **Aim:**
  - **to identify specific requirements**
  - **explore proposal from stakeholder and user perspective**

Working Group 2: Providers' Forum

- **Neil Chapman Chair and Rapporteur**
- **Aim:**
  - **to identify specific delivery mechanisms**
  - **to explore proposal from education and training providers' perspective**

Topics

- Who are the providers?
- What benefits could we deliver by working together?
  - delivery mechanisms
- How do we ensure competition?
- How could we help accreditation?
- What would we expect from the Management Board?
- What would we expect from the Executive?
- How would the Provider's Forum work?

Who are the providers?

- Universities
- Specific Training Organisations
- Research Institutes
- Waste management industry organisations
- Commercial / consultancy provision

EC Integrated Projects are also providers

Dual role of some: provider and users

In house training

- Involves cooperation between universities and in-house training providers

What benefits could we deliver by working together?

Enables: (education)
- Communication at a minimum
- Recognition across Europe
- Mobility
- Language

Training and Education
- Interdisciplinary capability
- Flexibility to respond to user needs
- Combined capability that 1 alone could not provide – broad pool of expertise
- Direct collaboration between academic and non academic

There are also benefits for providers:
- Attract excellent students
- Ensures some guarantee of continuity and use
- A common perspective

E&T providers have the capability to provide what is required by users

How do we ensure competition?

- Competition based on quality
- Quality requires monitoring (Advisory Board)
- Open and transparent network
- Transparent process for setting up E&T activities

If CETRAD is successful it may cause problems for other organisations

How could we help accreditation?

Academic Courses

Uniformity across Europe?
- Is it achievable?
- Guide users may be more achievable
- Accreditation assists in making things comparable

University Quality Assessment
- ECTS is currently being used
- CETRAD accreditation – development of a recognised brand

Use of established accreditation initiatives
- ENEN
- Erasmus Mundus

Develop specific programmes for individuals

How could we help accreditation?

Non academic courses
- Diploma with CETRAD logo
- Comprehensive course content description
- Provide this information to universities who may use these courses as modules
- Compare with Erasmus Mundus process
- Consider training level with respect to life long learning and future formalised European education systems

What would we expect from the Management Board?

Clear guidance, clear programmes, continuity

Adequate preparation time – 3 year cycles

Task perspectives

Specification of format of delivery
- Guidance on course length
- Guidance on value of distance learning
- Guidance on practical learning

Views from users on their requirements for testing and examination

Estimate of market size (guarantee of participant numbers?)

What would we expect from the Executive?

Marketing

Database of provision – courses and content

Where necessary for efficiency:
- Liaison between course participants and providers
- Checking student credentials/background
- Financial management

Secretariat support for providers' forum

How would the Provider's Forum work?

Respond to Board requirements
- Annual meeting
- Seminar – key issues

Could act as a core group, representative of the different types of provider

Providers to be part of an organised open network

Could be elected from the providers by the providers forum

Liaison with the broader providers group to ensure mutual agreement of aims and objectives

Representative of providers forum on advisory group

Who will be on the providers group?
- Open to all providers