Supporting sustainable uranium mining in less prepared areas

Rational: Uranium mining is an industry that has long been associated with causing significant environmental impact. There are legacy sites arising from uranium mining which are sources of contamination and pollution and are the centre of adverse public attention and concern. The world community has taken greater notice of environmental issues and efforts to protect the environment, public and improve the environmental management of mining.

Due to the nuclear energy renaissance, uranium mining has seen an upsurge of activity. This activity includes increased production from currently operating mines as well as exploration and exploitation of new resources and a return to previously uneconomical resources. Even uranium resource base is adequate to meet the projected requirements; a major challenge is to develop environmentally sustainable mining operations and to bring increasing quantities of uranium to the market in a timely fashion. Assistance and attention is more and more needed in relation to mines in less prepared locations. All of these developments need to incorporate management systems that take into account both improved environmental management, in line with current standards, and application of the principles of sustainable development.

This proposal focuses on practical implementation of the sustainable development of uranium mining and processing operations in Africa in the context of the four cornerstones of sustainable development, namely:

- Environment;
- Social issues;
- Economics, and;
- Governance.

A sustainable industry is one that balances environmental, social and economic requirements. Concentration on only one aspect is certain to cause conflict with the others. For example, focusing exclusively on environmental protection can make an operation unprofitable and a failing business will lose shareholders and be unable to develop and meet its social obligations. However, the emphasis on particular aspects will vary with the specific operation and its local physical and social environment. Proper governance will have in place the structures required to permit achievement of an appropriate balance.

Project description: The IAEA project will focus on all elements of sustainable mining, namely:

Environmental issues

To ensure that the environmental aspects of sustainable development are respected, the industry/operator must:

- Promote responsible stewardship of natural resources and the environment, including remediation of past damage;
- Minimize waste and environmental damage throughout the whole supply chain;
- Exercise prudence where impacts are unknown or uncertain; and
- Operate within ecological limits and protect critical natural capital.

Tailings, waste rock and water management have been, and will continue to be, the most challenging areas in terms of achieving good environmental performance. If uranium mining and processing operations are to be regarded as sustainable then management achievements in these areas must be of the highest order.

Social issues

The social aspects of sustainable development require:

- Ensuring the fair distribution of the costs and benefits;

- Respecting and reinforcing the fundamental rights of human beings;
- Sustaining improvements over time, by ensuring that depletion of natural resources will not deprive future generations; and
- Optimizing utilization of human resources by developing competences, improving training and exchanging know how.

It is clear that mining operations can have both positive and negative economic and social impacts on communities. Mining can provide employment and business opportunities to local communities. However, improperly managed mining activities can adversely impact the environment and the local population, and in the worst cases result in displacement of local settlements.

Although developed countries have produced strategies to handle the impact of problems on local communities, in many cases developing countries do not have such strategies. Hence, it is important that assistance be made available to them to develop such tools.

Economic issues

The economic aspects of sustainable development require:

- Maximizing human well-being;
- Ensuring efficient use of all resources, natural and otherwise, by maximizing returns;
- Identifying and internalizing environmental and social costs; and
- Maintaining and enhancing the conditions for viable enterprise.

Sustainable development of uranium mining and processing operations requires identification and response to the economic constraints of the industry. In many market based economies, uranium mining and processing operations are corporate profit centres, whereas in some developing countries these operations are viewed as a source of economic exchange.

Individual companies and countries can approach this profitability concept in various ways. However, specific elements of major importance to the sustainability of mining and milling of uranium include the open nuclear fuel market, industry profitability measures, ore deposit characteristics, the regulatory environment, availability of resources, and investment and taxation. These should be integrated with social, environmental and governance factors in order to ensure sustainability of operations.

Governance

The governance aspects of sustainable development require:

- Ensuring transparency by providing all stakeholders with access to relevant and accurate information;
- Ensuring accountability for decisions and actions, which are based on comprehensive and reliable analysis;
- Encouraging cooperation in order to build trust and set shared goals and values; and
- Ensuring that decisions are made at the appropriate level, as close as possible to and with the people and communities most directly affected.

To ensure sustainable development of uranium mining and processing operations, a system of governance is required to define the roles, rights and responsibilities of all stakeholders (governments, companies, investors, labour unions, communities, international institutions and non-governmental organizations). This allows for the weighing of costs and benefits, as well as compromises reached on the development and operation of uranium mines in order to meet competing demands.

Planned activities: Planned activities for target audiences (government, industry, other stakeholders) will include the following.

Member States/governments: The IAEA will provide guidance, training and disseminate information to support and help government activities to

- Develop consistent energy policies;
- Ensure that appropriate governmental and regulatory infrastructure is in place.

Industry: The IAEA will provide guidance, training and disseminate information to support and help industry activities to

- Complete (1) a stakeholder identification and needs analysis study, and (2) an environmental, social and economic impact and risk analysis;
- Optimize benefits to all parties;
- Demonstrate that they have sufficient technical and financial resources to ensure the sustainable development of an operation;
- Consult and communicate with stakeholders at the local community level in an open and transparent manner, provide information to these stakeholders and provide education and training where necessary to assist them in better understanding mining and mineral processing operations, thus enabling them to make informed decisions;
- Define sustainable development policy and develop actions that improve environmental, social, and economic performance of a company;
- Develop standards for collecting, measuring and analysing data, and communicating results to stakeholders; and
- Adopt programmes (eg. ISO 14000) that can be used to demonstrate compliance with environmental requirements and commitment to continual improvement in environmental performance

Communities: The IAEA will provide guidance, training and disseminate information to support and help community activities to

- Recognize that companies need to be profitable for both the community and company to benefit from the mining and processing operations;
- Develop their own plans for sustainable development and negotiate with mining companies to develop joint plans for mutual benefit; and
- Recognize that mining operations have a limited life expectancy. Benefits from the mine should be applied to the long term benefit of the community.

Support for the Introduction of Uranium Mining

Under several projects and activities, such as TC RAF3007, we currently deliver training on all aspects of the Uranium Production Cycle (UPC); however, the training packages delivered are modified for each case to cover required scope and there is no over-all, comprehensive package, which would cover the entire subject area without overlap. Additionally, we are only able to deliver the training in English, while the majority of African uranium-producing countries are French-speaking.

*Under this initiative we would perform the following tasks (**deliverables**)*

Task	HR	Non HR	Amount	PSC (7%)	Total
A P-4 for 3 years (incl. common staff costs)	Temporary Assist.		395 550.00	27 688.50	423 238.50
Assemble our existing UPC training material into a comprehensive UPC course package. We would modify the course units so that they cover their respective topics completely and that the combined package covers the breadth of the UPC without undue overlap.		Contracts	75 000.00	5 250.00	80 250.00
Consultancy to review course package		Consultancies	25 000.00	1 750.00	26 750.00
		Contracts	25 000.00	1 750.00	26 750.00
Course material to be translated into French.		Translation	30 000.00	2 100.00	32 100.00
Consultancy to review course package (French)		Consultancy	10 000.00	700.00	10 700.00
		Contracts	10 000.00	700.00	10 700.00
Finalize **course package**.		Contracts	25 000.00	1 750.00	26 750.00
Preparation to deliver training session, including pre-project mission, if necessary		Contracts	20 000.00	1 400.00	21 400.00
		Travel	10 000.00	700.00	10 700.00
Deliver **training** course.		Contracts	50 000.00	3 500.00	53 500.00
		Travel	30 000.00	2 100.00	32 100.00
Review results and feedback. Incorporate feedback into (English and French) training material		Contracts	35 000.00	2 450.00	37 450.00
Prepare and issue **final report** on training as-delivered.		Contracts	10 000.00	700.00	10 700.00
TOTAL			**750 550.00**	**52 538.50**	**803 088.50**

Additionally, this would leave us in a position to repeat the delivery as required and to efficiently prepare and deliver similar courses in other regions, such as East Asia.

Grand Total: US $803 088[1]

[1] US$ 450 000 have been awarded.

Support to Asia-Pacific Region countries embarking upon uranium resource exploitation to introduce and develop good practice in all aspects of the uranium production cycle.

1. Project objective

To assure that countries that are developing uranium mineral resources in the Asia-Pacific Region plan and implement in a timely manner adequate formal and technical infrastructure that will allow for safe and technically optimal management of all activities in the uranium production cycle.

2. Project background and rationale

Currently there are several Member States in the Asia-Pacific (APC) region expressing interest in acquiring nuclear power facilities, and some of these have indicated an interest in locating and possibly developing their own domestic sources of uranium to support their possible future power programmes. The States in question include Malaysia, Indonesia, Cambodia, Vietnam and Thailand as well as Mongolia, China and India.

At present there are TC activities related to uranium resources exploration and development only in China and Mongolia. China is actively undertaking exploration and significant mining development can be expected in the next few years. In Mongolia, Canadian and French mining companies have projects ready to commence at least trial mining and perhaps even full operations. There are also high levels of interest and activity from Russian and Chinese mining organisations looking at commencing uranium resource development in the near future. The Mongolian regulatory institutions and infrastructure are not ready to cope with this situation and will require significant assistance.

Of the other states mentioned, Indonesia has announced exploration activity and resource evaluation, and uranium exploration is on-going in Cambodia and Vietnam. Malaysia may also be exploring for uranium. It would seem prudent to be pro-active and provide information on best practices at the outset, potentially avoiding a repetition of the issues seen recently in Africa. There mining companies have pushed ahead with projects citing the economic imperative to develop resources quickly whilst Governments are struggling to understand what is involved and how they should be reacting and preparing themselves to regulate such activities. A programme, such as the one envisaged here, to raise awareness and provide basic information on best practices should be the first step in ensuring that uranium resources of this region are developed in an orderly, safe, sustainable and balanced fashion.

There are already on-going Technical Cooperation (TC) regional projects relating to training in good practice in uranium production cycle (UPC) activities in Europe (RER3010), Africa (RAF3007) and Latin America (RLA3010). As an interim measure to respond to the interest in the APC region, the Agency's UPC unit has budgeted to hold a training course in Darwin, Australia, 17-25 October 2011. The preliminary discussions with possible host government departments were positive, but it was explained that due to budgetary constraints the event would have to be run with a smaller number of participants than was originally envisaged to keep local costs down. Since these initial discussions it has become apparent that there is a growing level of interest in the region as additional countries have expressed interest in attending such a course; at the same time recent events in Australia (including increased financial constraints and weather events that have curtailed uranium production) may be placing even tighter constraints on their ability to fund local costs both this year and into the near future. Rather than limit the event to a small number of participants it is hoped that we may be able to obtain sufficient funding to operate with 30-35 participants, as is the case for RAF3007.

The region would benefit greatly from a project to offer training in UPC good practice spread over the next 2-3 years, or possibly longer. The idea would be to have an initial meeting in Australia where there are active mines and then to rotate a structured programme of specialist training events, targeting exploration, feasibility studies and development issues for regulators (and possibly operators) over the following 2-3 years. Events could be organized at intervals of approximately 6 months.

This programme would follow the hitherto successful model actively running in RAF 3007. The estimated costs would be of the order of €20 000 – €30 000 per meeting with one meeting in 2011 and then 2 per year for 2012 and 2013 with a possible extension into 2014.

The funds would be used to offset local costs where necessary, as well as to provide support for participants from within the region to attend the training. Local costs may include venue hire and transport to existing mine and exploration sites to undertake practical training.

Depending on actual UPC project developments within the region the programme could then continue as required; future training events would be designed to target observed market requirements in specific areas. As uranium mineral resource exploration and development is a lengthy process it is possible this programme could be run for up to 7 years in the first instance.

3. Planned activities and project steps

The project will therefore include:

4.1 Production and distribution of a fact-finding questionnaire to all potential participant Member States seeking data on UPC activities.

4.2 An initial training course in Darwin Australia in October 2011 which would also serve to obtain additional basic data on the UPC development plans of participating Member States.

3.3 The development of a training programme to be delivered through the region at a series of venues in rotation to address the identified needs of the participating Member States. Allow for one training course every 6 months over a period of three years.

4.4 Supplement the training courses with country specific expert missions as requested to deal with specific local uranium resource development issues. While the training courses described in Item 4.3 deal with issues in a structured programme over the duration of the project and involve only 1-2 people per Member State, these supplementary expert mission will deliver short training specifically tailored to approximately 15-20 people in one country dealing with a specific problem.

4. Financing Plan

Description	Estimated Cost in Euro	US$ (ROE: 0.7720)	PSC (7%)	Total US$
Prepare, distribute, receive and analyse fact finding questionnaires (Q2-3 2011)	10 000	12 953	907	13 860
Initial training course in Australia (Oct 2011)	40 000	51 813	3 627	55 440
Complete schedule of 6 training courses for 3 years (2012-2014)	180 000	233 161	16 321	285 332
Allow for up to 10 expert missions between 2011 and 2014	70 000	90 674	6 347	110 962
Total	**€300 000**	**$388 601**	**$27 202**	**$415 803**

Grand Total: $415 803[1]

6 Expected outcomes

It is anticipated that each newcomer country involved in the programme will:

- Establish its an appropriate uranium mining regulatory infrastructure,
- Develop plans for creating technical infrastructure,
- Ensure appropriate good practices are implemented in all uranium production cycle activities
- Develop appropriate skills and experience in regulation of uranium mining.

[1] US $101 000 has been awarded

Uranium Mining and Remediation Exchange Group (UMREG)

1. Project objective

To assist countries involved in all stages of the uranium production cycle (UPC) to introduce good practices as both operators and regulators throughout all stages of the UPC through the provision of practical advice and training.

2. Project background and rationale

The uranium mining industry has always been cyclic in nature but the last 'quiet period' extended for some 20 plus years until the recent revival began in 2003. This has resulted in many legacy sites remaining un-remediated and few new projects starting up, including resource exploration. Most significant has been the depletion of the skill and experience levels in the diminishing and ageing workforce. Few young people were attracted to the uranium mining industry between 1980 and 2003 with the result that much experience has been lost and poor succession planning has resulted in skill levels declining; also adequate training of new personnel, where they were available, has been difficult.

The UMREG forum has been maintained as an informal group for nearly 20 years and is regarded as a valuable resource and mechanism through which practitioners in the global uranium mining industry (both operators and regulators) can obtain information and exchange ideas and experience on a semi-regular basis. However, the funding for even semi-regular meetings has recently been discontinued. With the upsurge in UPC related activity this forum needs new support to enable it to continue to function and become more regular to meet the increased demands of the resurgent industry.

UMREG has previously always held meetings in association with existing international conferences but, given the present situation, there is interest in moving towards adopting the forum within the regular budget activities of the NFCMS Section. However, the Agency's current budget and that proposed for the next biennium, 2012-2013, do not include UMREG. Therefore, extra-budgetary funding is being sought. This project would enable UMREG to meet annually from 2011-2014. It is envisaged that UMREG would meet in Vienna and in another suitable venue in alternate years. Thus participants could access information and exchange information and training in UPC activities more frequently during this time of increased demand. Funding requirements will be modest but will result in a significant increase in the distribution of practical experience and knowledge in good practice amongst the global uranium mining community, both regulators and operators – especially those newcomers to the industry.

3. Planned activities and project steps

The project will therefore include:

4.1 Facilitation of the preparation of an annual meeting for the exchange of knowledge and experience in current UPC good practice.

4.2 Funding for the organisation of an annual meeting of UMREG and the implementation of that meeting, including preparation and distribution of information materials and reports.

4.3 Funding of a web-based system to facilitate information exchange and discussion on UPC activities and good practice.

4. Financing Plan

Description	Estimated Cost in Euro	US$ ROE:0.7720	PSC (7%)	Total
Annual cost of meeting preparation for each of 4 years - outsourced	100 000	129 534	9 067	138 601
Implementation of an annual meeting for each of 4 years (including support for LDC participants) Alternate years the meeting would be in Vienna	250 500	324 482	22 714	347 196
Total for all 4 years	**€350 000**	**$453 016**	**$31 781**	**$485 797**

Grand Total: $485 797[1]

6 Expected outcomes

It is anticipated that starting in 2011 the UMREG forum would provide:

- Better dissemination of information on UPC good practice throughout the global uranium mining industry,
- Improved communications between practitioners that will lead to fewer poor performances in UPC projects,
- Assurance that appropriate good practices are more likely to be implemented in all uranium production cycle activities,
- Improved levels of skills and experience in regulation and operation of uranium mining.

[1] US $139 000 have been awarded.

Coordinated research project (CRP) on spent fuel performance demonstration

Rationale

The total amount of spent fuel that has been discharged globally from power reactors is approximately 320 000 tonnes of heavy metal (t HM). Of this amount, about 95 000 t HM have been reprocessed, and about 225 000 t HM are stored in spent fuel storage pools at reactors or in away-from-reactor (AFR) storage facilities. Many spent fuel storage pools are approaching their full capacity, and AFR storage facilities are being regularly expanded both by adding modules to existing dry storage facilities and by building new facilities. In addition to expanding capacity, most countries are now planning for lengthening storage periods. Indeed spent fuel may have to be stored for longer periods than originally envisaged, i.e. 100 years or more. Moreover, target discharge burnup is steadily increasing. This results in increased challenges, such as fission gases, pellet integrity issues and cladding corrosion and degradation, which, in turn, lead to increased cladding stress.

The first dry storage facilities are already reaching the end of their originally licensed periods. Because final repositories for spent fuel or high level waste (HLW) will not be in operation until the 2020s at the earliest — and then only in a few countries — licenses for storage facilities need to be extended or renewed. To do so, it is important to assess the performance of spent fuel in storage in order to confirm the viability of extended storage and future transport. In support of such assessments, some examinations of spent fuel performance have taken place. The USA has examined a storage cask and its contents after 15 years of storage to obtain data in support of license extensions for low burnup fuel. Other countries, including Japan, are expected to also perform long term monitoring to demonstrate the integrity of stored spent fuel.

This proposal is to develop (one year) and conduct (four years) a coordinated research project (CRP) to increase the coordination among such efforts so that they yield increased joint benefits for all participants and generate results in a form that is useful to countries considering or starting nuclear power programmes as well as to countries with established nuclear power programmes (and existing accumulations of spent fuel). The overall result should be a widely shared improvement in the nuclear power community's ability to understand important phenomena and processes and their implications for the extension of licences for spent fuel storage and transport.

Objectives

- Create a network of experts working on current research projects to demonstrate the long term performance of spent fuel.
- Develop a technical knowledge base (including models and assembled experimental data) on the long term integrity of spent fuel.
- Develop an agreed method to adequately demonstrate long term spent fuel performance.
- Develop the capability to assess the impact of high burnup and MOX fuel on long term spent fuel storage, transport and disposal.
- Document the technical basis for demonstrating long term spent fuel performance demonstration to facilitate the transfer of this knowledge to newcomer countries.

Approach

In its first year this five-year project will prepare a CRP to be conducted in the project's remaining four years.

First year activities (spelled out in more detail below) will focus on:

- assembling the network of experts whose collaboration will be important for a successful project,
- convening meetings to, first, review existing research, plans, results, data and models and, second, develop the performance assessment method that will be applied in the CRP,
- conducting necessary research related to developing the performance assessment method, and
- documenting the performance assessment method to be used in the CRP.

Substantively, the first year activities will

- review and assess national research plans for materials used in spent fuel storage and national long term monitoring programmes,
- review methods for demonstrating the very long term integrity of spent fuel,
- update experimental results on spent fuel storage, transport and disposal as a continuing effort,
- review potential fuel degradation mechanisms and assess their relevance for extended long term storage and future spent fuel management,
- review operating experience in spent fuel handling, its potential impact on spent fuel integrity, and current challenges related to the handling and transportation of spent fuel after very long term storage, and
- develop and document the method to be used in the CRP for demonstrating the very long term integrity of spent fuel.

Activities in the remaining four years will comprise the research done by the CRP participants, regular research coordination meetings (RCMs), necessary support from the IAEA Secretariat, and, in the final year, analyzing and documenting the research results.

Costs

1st year: total $100,000

Initial consultancy meeting to engage the necessary experts, review existing plans, programmes and methods as described above, and set the detailed agenda for the rest of the project: $10,000

Technical meeting to collect data, update experimental results, review and assess degradation mechanisms, and review fuel handling operating experience and challenges: $30,000

Consultancy meeting to develop CRP's method for demonstrating spent fuel performance: $10,000

Contracts for research related to developing the CRP's method for demonstrating spent fuel performance: $30,000

Technical documentation of the method for demonstrating spent fuel performance: $20,000

2^{nd}, 3^{rd}, 4^{th} and 5^{th} years: $100,000 per year

A total of $100,000 per year for the CRP's research contracts, RCMs, necessary support from the IAEA Secretariat, and, in the final year, analyzing and documenting the research results.

	2011	2012	2013	2014
Research contracts	100 000			
Research contracts		100 000		
Research Contracts			100 000	
Research Contracts				100 000
Subtotal	100 000	100 000	100 000	100 000
PSC (7%)	7 000	7 000	7 000	7 000
Total	107 000	107 000	107 000	107 000

Grand Total: $428 000[1]

[1] US $207 527 have been awarded.