

Interregional Project Concept Template (Category A)

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The information contained in this template will be uploaded to the PCMF IT platform by the Division of Programme Support and Coordination by **30 August 2012** at the latest. Based on this information the IAEA will assess whether this project concept is in line with the TC quality criteria and requirements. Concepts positively appraised will be further developed into full project documents during the design phase.

Title	Development of Sealed Radioactive Sources for Emerging Therapeutic and Industrial Application
Field of activity	Isotope Production
Interregional project category¹	<input type="checkbox"/> Transregional <input type="checkbox"/> Global standard setting <input checked="" type="checkbox"/> Capacity building for developing countries <input type="checkbox"/> Joint TC activities with an international entity
Analysis of interregional Gaps / Problems/needs	<p>Give an in-depth analysis of the major problems/needs to be addressed by the project, as well as of their causes and effects; and explain why they are of an interregional nature. Refer to past national/regional or interregional efforts made in addressing these problems/needs, if any, and explain how the current project proposal builds upon them. Attach any supporting documents (e.g. feasibility studies, texts of interregional programmes that are relevant to the proposed project).</p> <p>Sealed radioactive sources are extensively used in agriculture, industry, medicine and various research fields in both developed and developing countries. The number of sealed radioactive sources worldwide is estimated to be in the millions. In industry they are widely used for non-destructive testing, food irradiation, radiation sterilization, "on-line" process control systems, elemental analysis and smoke detection. Radionuclides commonly used for industrial sealed sources are ⁶⁰Co, ¹⁹²Ir, ²⁴¹Am, ⁹⁰Sr, ¹³⁷Cs, ⁶³Ni, ²⁰⁴Tl, etc. The most prominent development in sealed sources include, ¹⁹²Ir source for high dose rate brachytherapy, ¹²⁵I and ¹⁰³Pd seeds for treatment of prostate and brain cancer, catheter mounted sources, stents and balloons incorporating ⁹⁰Sr, ⁹⁰Y, ¹⁴⁴Ce, ¹⁶⁶Ho, ³²P, ¹⁸⁸Re, ¹³³Xe for vascular therapy, ¹²⁵I and ¹⁰⁶Ru sources for improved ophthalmic applications and ⁶⁰Co sources used in "gamma knives". In up to 40% of the 500,000 patients treatment with balloon coronary angioplasty in the US every year, the blood vessels restenose. In two clinical trials, investigators using endovascular brachytherapy were able to decrease the incidence of restenosis after 1 year from 54% to 15% and 17%, respectively</p>
Why should it be an interregional project?	<p>Indicate why it is better to address these problems/needs through an interregional project (as opposed to a regional or national one).</p> <p>It is easy to access on interregional level because few countries worldwide which are producing sealed sources and Pakistan will be new one in this field so it is better to attain support from inter regional countries than regional countries</p>
Stakeholder analysis and partnerships	<p>Describe the stakeholder analysis conducted, specifying all the interested or affected parties, end users, beneficiaries, sponsors and partners identified, with clearly defined roles for each entity.</p> <p>Pakistan Atomic Energy Commission will be the sole stakeholder. Various nuclear medical centre, Agriculture and industrial institutes will be the end users.</p>
Overall objective (or developmental objective)	<p>State the objective to which the project will contribute, and demonstrate its linkage with a broader development goal or priority. It has to be in line with the problems/needs identified.</p> <p>Sealed radiation sources are widely used in different types of isotopic apparatuses and also in nuclear medicine for radiotherapeutic purposes. The sources range in activity from a fraction of a µCi used for calibration purposes to several thousand curies in industrial irradiators. The facilities for their preparation vary in complexity depending on the type of radiation and level of the radioactivity handled. The sources are also used in the metallic form, impregnated into ceramic, electroplated on other metals as thin films or</p>

¹ See the document entitled "Policy and Procedures for TC Interregional (INT) Projects" at: http://pcmf.iaea.org/DesktopModules/PCMF/docs/2014_15_Docs/notes/INT_Policy.pdf

	<p>deposits. They are encapsulated into inert metallic capsules in many cases. The use on various high energy β-emitting radionuclides in intravascular brachytherapy sources for the radiotherapeutic reduction of restenosis at balloon-angioplasty sites has been under considerable investigation by the cardiology and radiation oncology research communities. Miniature radioactive sealed sources of ^{90}Sr, ^{90}Y for endovascular therapy following angioplasty, ^{103}Pd and ^{125}I sources (termed seeds) for implantation therapy of prostate cancer are increasingly finding applications in developing countries. The production and quality assurance of miniature sources involve sophisticated technique and technology. Investigating methods of production of small size sources and establishing quality assurance procedures and their greater availability is interest for health sector</p>
Analysis of objectives	<p>Draw up an objective tree to highlight the hierarchy of objectives as well as the cause-effect logic that this project is expected to achieve.</p> <ol style="list-style-type: none"> 1. Feasibility of the project 2. Laser welding techniques 3. Irradiation 4. Transfer 5. Hot Cell 6. Activity measurement 7. Source preparation 8. Supply of sealed sources to users
Role of nuclear technology and the IAEA	<p>Indicate the nuclear technique that would be used and outline why it is suitable for addressing the problems/needs in question. Is this the only available technique? Does it have a comparative advantage over non-nuclear techniques?</p> <p>What specific role is the IAEA expected to play in the project?</p> <p>The role of nuclear technology is very important in sealed sources technology. This includes target irradiation, sealing. The miniature size of these sources and high degree of uniformity in activity distribution needed throw technical challenges in the production and effective quality assurance. Also many of these sources, such as ^{125}I, ^{103}Pd, ^{144}Ce, and ^{106}Ru sources are based on the active core production from the primary radioactive preparations. Various techniques can be potentially applied for radioactive deposition/fixation in the active core, like electrochemical deposition, adsorption, precipitation, pressing, etc. Moreover these techniques can include special procedures for improving active core/source properties such as decreasing radionuclide leaching in case of unforeseen source damage. These are potential areas for R & D efforts in source production. The necessity of special designed and remotely operated precise positioning system for source assembling and sealing/welding in a hot cell offers another area of development efforts. Development of sealed sources and its quality assurance methodologies is also important through IAEA. IAEA support is very important for achieving the goal.</p>
Project duration	<p>Indicate a realistic starting date and the number of years required to complete the project. (In the case of projects expected to exceed four years, an assessment will be conducted before the end of the fourth year to decide on the validity of an additional year.)</p> <p>Four years after acceptance of project</p>
Requirements for participation	<p>Indicate the minimum requirements that counterpart institutions in Member States would need to meet in order to participate in this project, and how the fulfilment of these requirements will be verified.</p> <p>Support by the interregional member states will be highly appreciated and supportive for the completion of project. The requirement are i.e</p> <ul style="list-style-type: none"> • Expertise in sealed sources production and QA • Posses a research and development orientation • Have already initiated R & D work in miniature sources production • Have encapsulation facilities for miniature sources (ex: lased welding and positioning systems).
Participating Member States	<p>List the Member States expected to participate in this project that meet the requirements established above.</p> <p>USA, Poland, Japan, China, UK e.t.c</p>

Funding and project budget		Provide an estimate of the total project costs and the funding expected from each stakeholder:	
		Euro	Comment
Government cost-sharing		800000	Local use
Counterpart institution(s)			Any one
Other partners			Any country
IAEA Technical Cooperation Fund (TCF):	Fellowships / Scientific visits / Training courses / Workshops	400000	
	Experts		
	Equipment		
TOTAL		1200,000	