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बी एआरसी न्यूज़लैटर

BARC NEWSLETTER

IN THIS ISSUE

बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

CONTENTS

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बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

REGULATORY WORK FOR NUCLEAR FACILITIES IN BARC

Theme Meeting Summary

H.S.Kushwaha, Chairman, BARC Safety Council and
Director, Health, Safety and Environment Group

Under the aegis of the BARC Safety Council (BSC), the BSC Secretariat organised a Theme Meeting on "Regulatory Work for BARC facilities" during 7-8 July, 2005 at the Central Complex Auditorium, BARC. Dr Anil Kakodkar, Chairman AEC & Secretary, DAE inaugurated the meeting. About two hundred and fifty Officers, members of the various Safety Committees and nominees from BARC, AERB and BRIT, participated in the meeting. This was the second occasion the Secretariat organized such an event, the first being a one-day seminar during November 2003, on "Safety and Regulatory measures for BARC facilities".

In his inaugural address Dr. Kakodkar stressed the need for maintaining a high standard of safety in the facilities and projects and for meeting the regulatory requirement, while maintaining the necessary confidentiality of the strategic application activities. He also said that, we should be responsible in our approach to safety and accountable to the public on environmental releases. We should also be logical in the application of rules and rigorous but flexible in regulatory reviews. Dr Kakodkar commented that the meeting was a timely event for the review of five years' experience feedback and complimented the organizers.

Mr H.S. Kushwaha, Chairman, BSC and Director, HS&EG, in his keynote address outlined the safety framework and the safety review process initiated by the BSC and other safety committees within the framework. There were six technical sessions followed by a panel discussion. Experts from AERB and BARC delivered fourteen invited talks, covering topics such as safety review of new projects, regulatory inspection and re-licensing,

**At the Inaugural Function at Central Complex Auditorium seen on the dais:
Chief guest Dr Anil Kakodkar, Chairman, AEC & Secretary, DAE in the Centre and others
from left to right Mr S.K. Mishra, OIC, BSC Secretariat, Mr H.S. Kushwaha, Chairman, BSC & Director,
HS&EG, Dr D.N. Sharma, Member-Secretary, BSC & Head,
RSSD and Mr K.T.P. Balakrishnan, Convener, Theme meeting.**

At the Panel Discussion on the dais (left to right): Dr. K.S.Parthasarathy, Former Secretary, AERB, Mr D.S. Shukla, Director, Ch.E&TG and Chairman, OPSRC, Mr H.S. Kushwaha, Director, HS&EG and Chairman, BSC, Dr L.M. Gantayet, Head, L&PTD & Chairman, DSRC (WMP).

safety review of accelerators, reprocessing facilities, waste management projects, radiological laboratories, transport of radioactive material, new construction and designing for external events. Mr P.B. Kulkarni, Chairman, CFSRC and Director, ESG, Mr H.S. Kamath, Chairman, CRAASDRW and Director, NFG, Mr D.S. Shukla, Chairman, OPSRC and Director, Ch.E&TG, Dr. J.K. Ghosh, Chief Executive, BRIT, Mr P.D. Sharma, Chairman, DSRC (RP) and former Executive Director, NPCIL and Mr H.S. Kushwaha chaired the sessions.

Issues on dose apportionment, employing contract labour, assessment of internal exposure etc. were covered during the panel discussion. Dr. K.S. Parthasarathy, Former Secretary, AERB, Mr D.S. Shukla, Mr H.S. Kushwaha and Dr. L.M. Gantayet, Chairman, DSRC (WMP) and Head, L&PTD, BARC were on the panel. The participants took active interest in the discussions. Following views emerged from the panel discussions:

i. Dose apportionment as a safety practice should be introduced for all BARC facilities. The apportionment should be based on past man-Sv consumption for the existing operating facilities and on assessment basis for new facilities. Compliance should be monitored and reviewed at appropriate levels periodically.

ii. The contract workers should be adequately instructed on safety practices and all the work should be under departmental supervision and with full Health Physics and Industrial Safety coverage.

iii. The present practice of internal radiation exposure assessment does not cover all the radiation workers with fixed periodicity. One reason for this is inadequate infrastructure for monitoring. The internal exposure assessment based on external exposure, is not the appropriate criterion for the selection of workers for monitoring purposes. It is necessary to cover all radiation workers for internal exposure assessment, at regular intervals.

बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

REGULATORY WORK FOR NUCLEAR FACILITIES IN BARC

Inaugural Address

Dr. Anil Kakodkar, Chairman, AEC & Secretary, DAE

First of all, I want to compliment the organizers for setting up this meeting. It is always good to take stock, go through the consultative process with all concerned, go through and review the past experience in conducting ourselves and wherever necessary, carry out suitable corrections in the regulatory processes. The five years that have gone by, is a sufficiently long period for this kind of an exercise to be taken up.

The traditions for safety work in general and safety regulation in particular, in BARC, is as old as the Department of Atomic Energy itself. The entire regulatory framework culminating in the establishment of the Atomic Energy Regulatory Board, evolved here. The evolution has been knowledge and experience based and is in contrast with the evolution in many other countries, where the rules are made first without understanding the full implications and then gets boxed up in the rules and lands into some kind of awkward knots, which cannot be easily untied. We have always given precedence to establishing an activity including the scientific aspects of regulation and then bringing the rules, so that the wordings in the rule take into account all ramifications. To that extent, our regulatory process is more robust. I think this practice has stood us in good stead. When it became necessary to separate the regulation of strategic activities from the Atomic Energy Regulatory Board, we had a good heritage to bank upon. So it was not difficult to create this new safety framework for BARC, which is both, rigorous enough and at the same time flexible enough and these features are important. Now, the very fact that this gathering here is so big indicates the extent of effort, that has been going on in regulations. Since all of you in some way or the other are connected with safety regulations in BARC, I thought I would use this occasion to share with you some broad aspects of what I perceive as a good regulatory framework. You can think about it, debate about it and wherever you think appropriate, bring it into your practice.

Dr. Anil Kakodkar, Chairman, AEC & Secretary, DAE

First of all, let me start with, why it became necessary to separate the regulations in BARC. As you

all know our programme is entirely devoted to developing applications for the benefit of our society, our country. In BARC we have a comprehensive R & D programme to develop these applications, which are of importance for the development of our country. Along side, we had this on-going evolution of research and development in safety area accompanied by safety regulations. A need was also felt to include developments, related to national security, in our programme in the national interest. Prior to 1998, it was not possible to articulate this in a formal way. However, we always had a kind of an informal overview of safety in all areas, which was very sensitive. We have maintained an uncompromising approach to safety all along. But the process, I would say, was more informal. After 1998 when it came out in the open that we have a national security dimension to our programme, it was obvious and natural that we also establish a formal framework, which can take care of the regulations of strategic activities. This has been done by first declaring BARC as an institution engaged in strategic activities. Now, that does not mean that everything that we do in BARC is strategic.

In BARC what we do is a comprehensive programme and as it was earlier, a good part of BARC's programme is in fact, devoted to the developmental process. In order to be sure that we can cover this entire regulation in a somewhat formal way, one has to define boundaries. It was as a part of that clarity for definition of boundaries, that we have defined BARC as an institution for strategic work and identified a separate internal safety review framework under the Director, BARC. Having done that, we have also said that, as far as the standards for radiation exposure and environmental releases are concerned, BARC has to comply with the standards established by the Atomic Energy Regulatory Board. The safety regulation in BARC is done by the BARC Safety Council, which is ultimately accountable to Director, BARC. As far as the radiation exposure and the environmental releases are concerned, BARC is also accountable to the public at large. In fact, it has been suggested that BARC should maintain a public information system, call it by way of a separate home page or annual reports but this aspect must be reported and the compliance demonstrated. This has been built in, right in the initial identification of the framework and I would strongly advise BARC Safety Council to bring this factor into force forthwith. This accountability to public in my view is absolute.

There is also the question of technology development in BARC. BARC develops several new technologies, which ultimately go out in the public domain and that is the way it should be. Any development programme must have an exit policy. If we say that we have developed this technology and it will remain with us for all time to come, then obviously this technology cannot be implemented in public, in society or in industry. So there must be an exit policy for any technology development effort. Once you grant that, it goes without saying that once the technology has gone out to be implemented by somebody else and it involves radiation or radiation safety, it has to come within the jurisdiction of Atomic Energy Regulatory Board. Then there is a situation in which you will have a technology that will be initially regulated by the BARC Safety Council and once it is transferred out, it will be regulated by the Atomic Energy Regulatory Board. How do we make sure that between the two frameworks there is a smooth transition and no gaps are left in between? It was in this context, that we made a further revision to say that BARC can make a request to the Atomic Energy Regulatory Board, identifying such areas which ultimately are going to be transferred. On the basis of that request, Atomic Energy Regulatory Board can take up regulation of those activities right in the beginning or in the early stages, so that there are no gaps when the transition is made.

This approach to safety regulation became important in the context of Advanced Heavy Water Reactor. Ultimately the AHWR technology will surely go outside and there is no point in carrying out safety regulation without involving the Atomic Energy Regulatory Board, since that could lead to lot of difficulties later. And so, as many of you may know, this matter has now been referred to the Atomic Energy Regulatory Board. Similarly radiation processing of food products will also go out and there are many other examples you can pick up. So, the point is, while it is absolutely necessary to define boundaries, which has been done, we are conscious of the fact, that technology never remains at one place, it moves and that's the way it should be. Therefore, we must make sure that the regulation is harmonised. Similarly reprocessing is entirely within BARC at this moment. But then we are also talking about developing the Fast Reactor Programme of a magnitude much larger, much bigger than the PHWR Programme.

The Fast Reactor Programme has reprocessing, re-fabrication and waste management as its integral parts. You cannot look at the power reactor programme and the fuel cycle programmes in the case of fast reactors separately, as is possible in the case of Pressurized Heavy Water Reactors. That part would certainly be entirely in the public domain, would entirely be subject to public review, both in terms of safety as well as in terms of economics. Unless we are able to show good competitive economics, there is no way the second stage of our Nuclear Power Programme will grow. This in turn means, that the technology evolution that will take place from the back end of the fuel cycle connected with processing of spent fuel from PHWR, would ultimately evolve into the technology for fuel cycle, attached to processing of spent fuel, from fast reactors. Now, with this evolution and the fact that the PHWR spent fuel reprocessing will be under the BARC Safety Council and the fast reactor spent fuel reprocessing will be under the Atomic Energy Regulatory Board, it is clear that one must make sure that there are no gaps, there are no discontinuities in the two regulatory functions.

Now reprocessing is an area, which is evolving. This is an area where the regulatory guides are yet to be fully written. So, it is necessary, in fact, I have been encouraging, that the safety documents, the codes and guides are better written by the Atomic Energy Regulatory Board and everyone participates in the development of such documents, which can be used both for regulation within BARC and also for regulation outside BARC. The basic framework for BARC Safety Council also requires, that wherever there is a regulatory code or guide established by Atomic Energy Regulatory Board, it shall be followed. The BARC Safety Council can engage itself in the development of additional codes and guides for areas, which are of urgent interest and necessity for its own work. Because the need for such documents in AERB would probably be felt a little later. Wherever such is the case that the need is urgent, the BARC Safety Council can get on with the establishment of its own regulatory documents and later on it is upto the Atomic Energy Regulatory Board to take stock of the existing documents, prepared by the BARC Safety Council and adopt them, with whatever modifications or upgradation that may be considered necessary. So the point I am trying to make is, that although we have created the BARC Safety framework out of necessity, it is absolutely important that there are parallels between the regulatory work that we do within BARC and the regulatory work that goes on in AERB.

The next point that I wish to make, is the question of dealing with activities within BARC. In BARC we have activities; some are quite open developmental activities, some are sensitive and some are super sensitive. The framework does provide for handling of these activities in different ways. Now, the sensitive work has to be done on need-to- know basis and that means the number of people involved cannot be very large,

because, then there is a possibility of pilferage of information. But at the same time, those who are involved must share information on need-to-know basis. This principle, while it is very important from the point of view of containing sensitive information; if implemented in a partisan manner, can be counter productive to safety and this we must understand. Need to know principle should encompass those who are capable of implementing a programme and also those who can independently review safety. That would be in keeping with the principles of safety management and good safety culture. It is important that the necessary sharing of information is done with knowledgeable people who have to be brought in the loop of safety regulation. Now, there is a converse to this also. The experts tasked with safety review must also maintain a balanced and mature approach. A logical approach consistent with existing rules is what we should aim at. Sometimes, we get into the rule trap. "I don't care, the rule says so and hence do it". Now that, I think, adds to unnecessary rigidity, which may not help safety.

It is absolutely important that activities in BARC are incident-free. Because, should there be any incident, it will be impossible to defend it. Further, it will be impossible to defend the fact that we are carrying out our safety work properly. In an open regulatory domain, for every incident, we can issue a press note, which we have been doing. We can tell the people in advance, so that there is mutual confidence building. That facility is not available in BARC when we are engaged in work of a sensitive nature. That in turn means, that everything that we do here, has to be incident-free and please note these words and remember this at all times. You just cannot afford to have an incident in BARC and when I say BARC, all facilities in Trombay and all facilities of BARC outside Trombay. So this has added an extra responsibility on all of you who are participating in the BARC safety framework.

At times I do notice people coming to me saying that Safety Committee is delaying things. When I get into details, I notice that things have not been sufficiently discussed. Things are overlooked and when such things come up at a later stage in the project, it become difficult. According to me, if you say that Safety Committee is delaying things, it could be a reflection on the competence of the project people. It is necessary that in the formulation of project requirements, we undertake full consultations with each other, in full appreciation of the entire knowledge base that exists with us, that exists with the people who are dealing with safety and also with other people who are participating in our technology activities.

In BARC we are doing many things for the first time, and so the requirements of safety would have to evolve. Under such situation, you won't find written rules. Rules, as I said earlier, can be written only when you have already done something, already have practised with it. So we have to go through a proper discussion, proper debate, identify the design basis which includes both the performance requirements as well as the safety requirements and agree that we will be designing this project or this facility, meeting with the requirements and then get into the formulation of the project costing and things like that. Many a times we do things the other way round. We first visualize something, without consulting anybody, give estimates and even before the ink is dry we change those estimates, because while we are talking, somebody else comes up with something, which has not been thought of earlier, leading to avoidable revisions. I think we have to take our work to a higher level of professionalism. If we do that, then the chances of delays would get minimized. I cannot say that by this the delays will be completely eliminated, because in any evolutionary activity we have to provide for some changes, but that cannot be the order of the day.

I wish to mention that the path of excellence, which has been the hallmark of activities in BARC, must continue to be nurtured, both in terms of technology area as well as in terms of safety regulation. For this purpose, one has to learn to manage this conflict, the conflict of maintaining secrecy, protecting sensitive information on one side and on the other side the need for a good informed debate among the individual people so that no aspect is overlooked. If we don't do that then, it is not difficult to see that in the name of secrecy, the consultation is not adequate and we have not promoted a fair discussion within our own groups or across groups that have to interact. This virtually amounts to promoting mediocrity. You may have very competent people with you, but if you have not allowed them to participate in the discussion, on one side you miss the opportunity of taking the benefit of their thought and on the other side somebody, who could have contributed, tends to be detached. That is a sure invitation to propagation of mediocrity. We must remain in search of excellence at all times. That requires a good debating atmosphere. Special efforts should be made to involve young people and mentor them in an environment conducive for good safety culture. In such an environment, a good safety performance as well as functional performance would be assured.

We have created the BARC Safety Framework, taking into account the special requirements of BARC. Now, we must take safety to higher standards, I mean professional standards. While technologies have to evolve, the understanding of all aspects, which may have safety significance with the evolution of that technology, must also be the subject of research and development in parallel. Whether it is fuel reprocessing, environment or chemical processes involving toxic elements, the technology related R&D and the safety related R&D must go hand in hand. And here, there is a tremendous need for co-operative R&D. It is not that all the R&D in safety has to be necessarily done in Health, Safety & Environment Group. This R&D has to be done both in Health, Safety & Environment Group as well as in the groups concerned with that technology. Wherever there is new knowledge, new insights of safety significance, it must be shared. Unless we share that knowledge, we cannot get robust in our safety implementation. In so doing, it is also important that wherever possible we involve universities. There are several issues which according to me, we should have had answers, may be much earlier. It is important that we accelerate the pace of such research and development and I am glad that HS & E Group is doing this. For example, we have a whole series of activities now in the context of uranium mining. We have been living with uranium mining for such a long time and it is not as if that knowledge base does not exist, but rigorous R&D is what we are talking about. The same thing is true in the context of environment and to some extent it is also true in the context of emergency management, radiation risk, chemical engineering operations and various other aspects connected with our work. We should have a comprehensive R&D in all these areas.

Now, manpower has always been a constraint. We have always had this difficulty. We want to do all these things, where are the people? This problem is not going to go away. But we must also ask a reverse question. Are we sure that whatever we are doing is the kind of thing we should be doing? If you ask that second question, you can easily find an answer that some of these things we are doing can be easily assigned to somebody else outside. When we do that, then, we make ourselves free to accommodate new R&D activities, which really we should be doing. As I said, there has to be an exit policy in technology development; there has to be also an exit policy in several knowledge related activities that we undertake. Something which we have been doing for the last 20 years, we must ask, why we should be doing it today? If somebody outside can do that work and if we require it today, we can certainly get the benefit

of getting such work done from people outside. This is where we can utilize the resources, which are available in the Universities and in other laboratories and a lot of work can be done. We should be knowledge workers in new areas and knowledge managers for traditional areas because, for our programme, we require both. I would want each one of you to be in some part a knowledge manager, getting knowledge related inputs from elsewhere and in some part a knowledge worker to engage in new knowledge activities which are required for our programme. If we act in this manner, we can multiply the human resource that we possess within us, at least a few times, if not more. Ultimately, it is the level of knowledge that is a guarantee for safety. High level of knowledge and a rigorous framework, put together, can virtually guarantee safety.

The last point that I wish to make, is with regard to safety culture and this is more easily said than done. It is always easy to tell somebody that you must have a proper safety culture without realizing or recognizing that it has not been ingrained properly in our own minds. Just like we say, that charity begins at home, each one of us must set a good example of good safety culture, good quality culture and a good managerial culture for others to emulate. There are people who are looking for exciting activities. They should have enough opportunities to discuss their ideas formally and informally. If there is a safety issue, we must discuss. Without a proper discussion, just calling the Safety Committee and writing the minutes does not resolve a safety issue. That is not the answer to the problem and in fact, it is reflective of a negative culture. I would encourage all of you to read the INSAG document on safety culture. Along with that document, there is a little checklist, which allows you to mark, grade yourself. See how many marks you get. I don't want you to tell anybody else how many marks you have got. You just assign marks, being true to yourself and if you do not come up to the very high strata, then I think you must do your own soul searching and see how you can improve. If each one of you does that, then the next step would be to do similar thing in small group activities, in your own sections and see where you stand. Then you can enlarge it further and finally you can come to BARC as a whole. If you do this kind of soul searching, I am sure, you will bring in necessary corrections in your working and the culture will further improve. It is an excellent document and a checklist and I would encourage that at least people who are involved in projects, people who are involved in safety regulations, must take a look at it and carry out this exercise.

With these words, let me wish that you would use this opportunity, to take stock of all that has happened, in the last five years, identify the weak areas and put in measures to strengthen those weak areas. I wish all of you good luck in thisendeavor, but as I said, the bottom line is incident- free operation in BARC and that is the challenge.

Thank you very much.

बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

REGULATORY WORK FOR NUCLEAR FACILITIES IN BARC

Role of the BARC Safety Council Secretariat

S.K. Mishra, Officer-in-Charge,
BARC Safety Council Secretariat

The BARC Safety Council Secretariat (BSCS) provides support to the BARC safety framework, by keeping track of the latest nuclear, radiological and conventional safety and environmental regulations. The Secretariat prepares safety status reports for review by BARC Safety Council (BSC), Operating Plants Safety Review Committee (OPSRC), Conventional and Fire Safety Review Committee (CFSRC) and other safety committees. As internal safety framework demands higher standard of safety culture, the Secretariat has an important role in monitoring the safety status of the various facilities and projects.

The Secretariat, regularly conducts training courses on basic radiological safety and regulatory measures for nuclear facilities. As part of its efforts to improve the regulatory measures and to nurture ideas for formulation of safety norms, especially for new technology projects, the Secretariat takes initiative to bring the experts together on a common platform. The Secretariat monitors the authorizations recommended by the Committee to Review Applications for Authorisations of Safe Disposal of Radioactive Waste (CRASSDRW) for the various facilities for transfer and disposal of radioactive wastes. Regulatory control on the transport of radioactive materials, preliminary assessment of the applications for the Radiological Safety Officers, review of safety documents and pro-active coverage of safety related observations are carried out by the Secretariat.

A web page on the BARC Safety framework has been prepared and released on a trial basis, as part of the BARC Technology Synergizer (BTS). The website will provide information, related to the safety of various facilities and the environmental releases.

संरक्षा संस्कृति

परिभाषा :

"संगठनों तथा व्यक्तियों में गुणधर्मों एवं अभिरुचियों के समुच्चय से यह प्रमाणित होता है कि नाभिकीय संयंत्र संरक्षा के मुद्दे सर्वोच्च प्राथमिकता के रूप में उनको सार्थकता के कारण आवश्यक ध्यान आकर्षित करते हैं ।"

संदर्भ आई एन एस ए जी-4[1]

SAFETY CULTURE

Definition:

"Assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance."

Ref. – INSAG-4[1]

बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

REGULATORY WORK FOR NUCLEAR FACILITIES IN BARC

Regulatory Control on the Management of Radioactive Waste

K.T.P. Balakrishnan, Member-Secretary,
Committee to Review Applications for Authorization for
Safe Disposal of Radioactive Waste (CRAASDRW),
BARC Safety Council Secretariat

The safe disposal of radioactive waste is governed by the General Statutory Rules (GSR) 125-Atomic Energy (Safe Disposal of Radioactive Waste) Rules 1987. The Atomic Energy Regulatory Board (AERB) has established necessary regulatory standards for enforcing safe practices in the management of radioactive waste. Since May 2000, the BARC Safety Framework, under the Competent Authority is responsible for the regulatory control of facilities under BARC. The Competent Authority exercises regulatory control on the management of radioactive waste in the facilities, with emphasis on restricting the generation of radioactive waste.

As per the GSR-125, all the facilities handling radioactive material, which are likely to produce radioactive waste, are required to obtain an authorization from the Competent Authority for the transfer/disposal of the waste. The application in the prescribed format is submitted to the BARC Safety Council (BSC) Secretariat. The "Committee to Review Applications for Authorization for Safe Disposal of Radioactive Waste (CRAASDRW)", which is part of the BARC safety framework and is constituted by the Competent Authority, reviews the requests and forwards its recommendations to the BSC for further review. Based on the recommendations of the BSC, the Competent Authority grants authorisation to the facility.

During the review the CRAASDRW and the BSC take into account, the type of operations involving radioactive material, generation of radioactive waste, handling and management of the wastes in the facilities. The waste is categorized, based on the form, content and level of activity and segregated accordingly, which helps in conditioning /treatment and the management of the waste.

Centralized waste management practices are adopted for liquid and solid wastes. Gaseous wastes are disposed by individual facilities after treatment and filtering. A stringent monitoring of the discharges is maintained. The facility maintains records, in the prescribed format, of the waste transferred to the centralized management facility or disposed off directly. A Regulatory Inspection Team (RIT) periodically audits the records. The facilities submit half-yearly and annual returns of the transfer/ disposal, giving details of the volume, activity and characteristics of the waste. The Secretariat scrutinizes the returns and ensures compliance of the authorized limits.

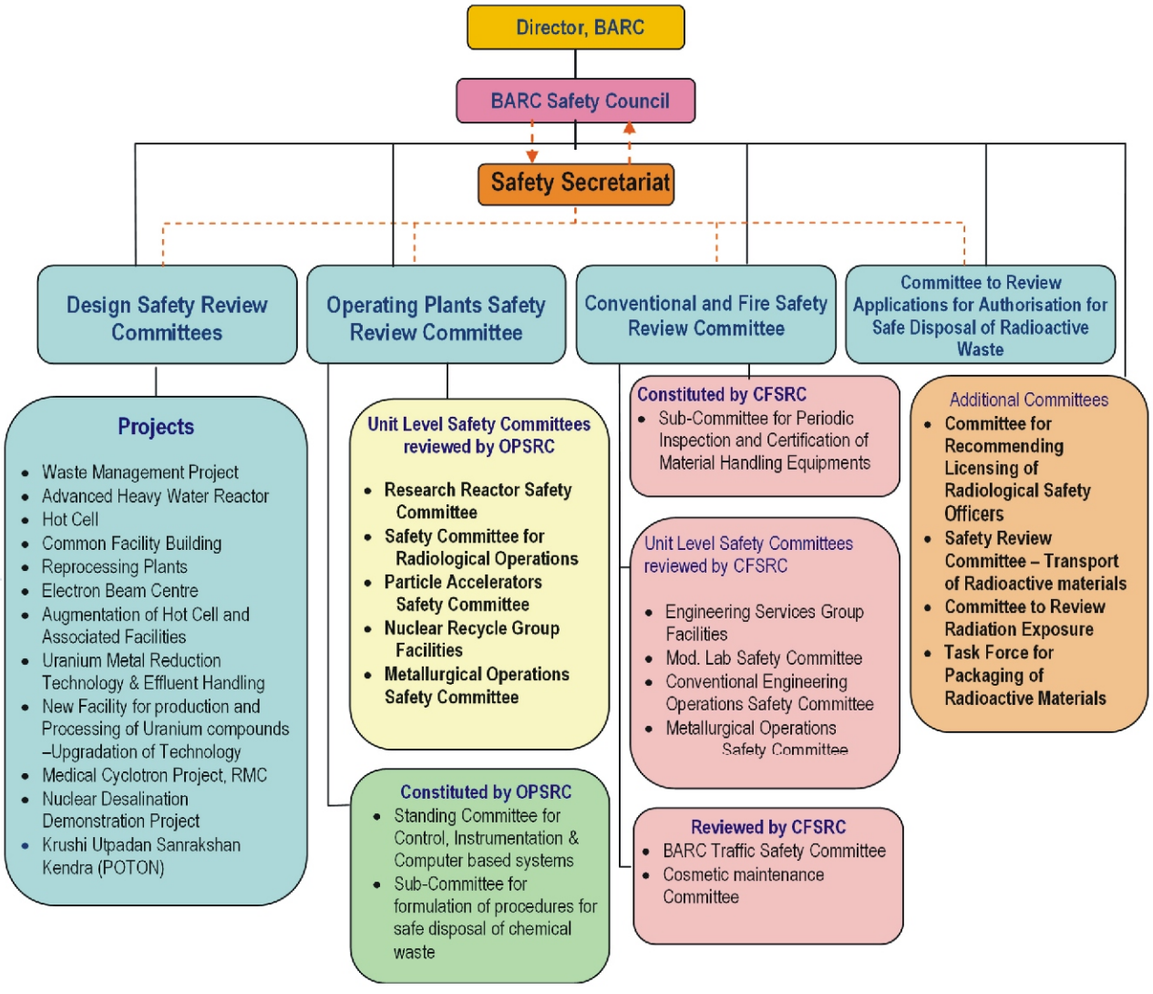
बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

REGULATORY WORK FOR NUCLEAR FACILITIES IN BARC

BARC Safety Framework

D.N. Sharma, Member-Secretary,
BARC Safety Council and Head, Radiation Safety Systems Division

Pursuant to a gazette notification, a separate safety framework was established in May 2000 for safety and regulatory coverage, for the facilities and the projects under BARC. Earlier, the Atomic Energy Regulatory Board was responsible for the same. The framework has a three-tier safety review system with the BARC Safety Council as its apex committee. The broad organizational framework for safety review of BARC facilities is shown below.



बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

REGULATORY WORK FOR NUCLEAR FACILITIES IN BARC

Importance of Safety Culture in Nuclear Facilities

S.K. Mishra, D.N. Sharma and H.S. Kushwaha
Health, Safety and Environment Group

Introduction

Nuclear facilities are high technology application centers, adhering to stringent regulatory measures, to ensure higher levels of safety. Application of high technology also provides the means, to achieve higher level of safety. A regulatory body for nuclear facilities, is entrusted with the responsibility of safety review, assessment and enforcement of compliance with its recommendations. Safety in the context of nuclear facilities means, the achievement of proper operating conditions, prevention of accidents or mitigation of accident consequences, resulting in protection of site personnel, the public and the environment from undue radiation hazards. The regulatory body assumes added responsibility when it is part of an internal safety framework.

"Safety culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, the protection and safety issues receive the attention warranted by their significance."

Safety Culture

A good safety culture sets a higher sense of responsibility on the organization, in dealing with issues, which can have more serious consequences. It also, in a way, fixes the order of responsibilities based on seniority in the management. Safety culture is itself a sub-set of the culture of the whole organization. In simple terms, it is " the way we do things around here."

A good nuclear safety culture has the following characteristics :

(i) When any possible conflict in priority arises, safety and quality take precedence over time schedule and cost.

(ii) Errors and near misses are seen not only as a matter of concern, but also as a source of experience from which benefits can be derived.

(iii) Organizational changes or activities are conducted in accordance with procedures.

(iv) When problems are identified, the emphasis is placed on understanding the root cause of the problem and finding the best solution, without being diverted by who identified the problem or who contributed to solving the problem.

(v) The goal of the supervising and management personnel is that, every task be done right the first time.

(vi) Practices and policies convey an attitude of trust.

(vii) Feedback is solicited to help identify concerns, impediments and opportunities to improve.
(viii) The organization has a commitment to continuous safety improvement.
(ix) Senior managers prevent isolationism and encourage the establishment of a learning organization.
(x) Every individual, every supervisor and every manager demonstrates personal integrity at every opportunity that arises, during the lifetime of the facility.
(xi) Every organizational change, every meeting and every safety assessment is taken as an opportunity to teach, learn and reinforce preceding characteristics and principles.

The responsibility for the safety lies with the facility management and the regulators can only advise them. The safety culture can be developed and strengthened in phases as follows:

(i) Safety is based on rules and regulations.
(ii) Good safety performance becomes an organizational goal and is dealt with primarily in terms of safety targets as goals.
(iii) Improvement in safety levels with active contributions from everyone.

The Defence in depth philosophy

The image of nuclear safety is international; an accident anywhere affects public opinion everywhere. The basic tenets of nuclear safety are its design, which are based on the philosophy of defence in depth. The various levels of barriers, by way of providing confinement/ containment and engineered safety features, put nuclear safety on a sound footing. The defence in depth philosophy addresses the management of an event as follows:

(i) Prevention
(ii) Control
(iii) Mitigation
(iv) Emergency Handling

"It is the safety culture prevailing in a facility, which ensures that at various stages of operation/event the intent is met with success."

Maintaining good safety culture

The effort and contribution from everyone in a facility, eventually shows, in the maintainance and in the rise of safety standards and in the management of any event, to an acceptable level. For maintaining a good safety culture, the following (only illustrative) aspects need to be addressed.

- Organizational set-up – with well defined responsibilities and team spirit
- QA Plan – operation/maintenance procedures surveillance plan
- Documentation - at various stages e.g. designing, construction, operation incidence reporting- timely and accurate report in line with INES grades record keeping - records should be graded and retrievable
- Industrial licenses
- Waste management - policy and records
- Recruitment, training and retraining policy
- Regulatory inspection/ audit details
- Radiological safety measures
- Emergency drill / measures
- Design change/ up-gradation
- Housekeeping and general hygiene etc.

Role of Regulator

A regulatory body promotes an effective safety management system, in the organization by ensuring

that, there is self assessment and correction (self regulation) and avoids acting in a manner, that diminishes the responsibility to safety, of the organization.

A regulatory body should have the authority to:

- Develop safety principles and criteria
- Establish regulations and issue guidelines
- Issue, amend, suspend or revoke authorizations and set conditions
- Enter a site or facility at any time to carry out an inspection
- Enforce regulatory requirements
- Communicate independently its regulatory requirements, decisions and opinions and their basis to the public.

The regulatory body monitors the performance of the organization and takes action if the safety management system becomes ineffective or the safety performance of the organization declines. The regulator ensures that the organization has an effective self-regulating safety management system and the regulatory body monitors the effectiveness. The regulatory body maintains open channels of communication with the organization.

Safety culture has two general components. The first is the necessary framework within an organization and is the responsibility of the management. The second is the attitude of the staff at all levels, in responding to and benefiting from the framework. Attention to safety involves several elements including

(i) Individual awareness of the importance of safety.

(ii) Knowledge and competence through training, instruction and self-education

(iii) Commitment to safety

(iv) Motivation

(v) Supervision, including audit and review practices, with readiness to respond to questions from individuals.

(vi) Responsibility, through formal assignment and description of duties and their understanding by individuals.

Safety Performance Indicator

Introduction of performance measures enables an organization, to set safety targets and to trend performance for the organization as a whole. A range of parameters needs to be considered, in order to provide a general sense of the overall safety performance of a nuclear facility. Most conventional quantitative indicators measure historical performance and thus their predictive capacity arises from extrapolation of trends or comparisons with past performance. Forward looking indicators which measure positive efforts to improve safety are more valuable, although they are recognized as being more difficult to develop and measure objectively. Measures of personnel behavior and attitudes can provide a significant impact on judgments, about overall safety performance.

Identifying Declining Safety Performance

In order to avoid any decline in safety performance, the management has to remain vigilant and objectively self-critical. Early signs of declining performance are not readily visible and tend to be ambiguous or hard to interpret. In fact, when signals are obvious, it generally means an indication of the onset of serious performance problems. A key to this, is the establishment of an objective internal self-evaluation programme, supported by periodic external reviews.

A typical pattern of declining safety performance in an organization, can be grouped in to five stages as follows :

Stage		
One	Overconfidence	Due to good past performance and unjustified self satisfaction
Two	Complacency	Minor events are overlooked
Three	Denial	More significant events are taken as isolated cases. Internal audit is ignored and corrective actions are terminated early
Four	Danger	A few potential severe events occur – (near miss situations)
Five	Collapse	A very clear stage. Management is overwhelmed and usually needs to be replaced

It is important that, in nuclear facilities, any declining performance be recognized after the first two stages or at least early in stage three.

The BARC Safety Framework

The regulatory review and assessment in BARC is carried out by an internal safety framework. The framework consists of a three-tier system. The BARC Safety Council (BSC) being the apex safety committee, endeavors to integrate safety, quality, technology and performance towards further strengthening of the safety culture in BARC. BSC has an over all responsibility in matters of health, safety and environment for all BARC facilities. Regulatory reviews of the operating facilities having radiological implications are carried out by Operating Plants Safety Review Committee (OPSRC). The Conventional & Fire Safety Review Committee (CFSRC) carries out regulatory review of the other facilities where radioactivity is not handled. A set of Design Safety Review Committees (DSRCs) carry out regulatory reviews of each of the various projects till their commissioning. The recommendations of the OPSRC, CFSRC and DSRCs are further reviewed and assessed by BSC. The OPSRC and CFSRC are assisted by Unit Safety Committees and the DSRCs are assisted by Working Groups.

The safety review framework is supported by a Safety Secretariat. The secretariat is entrusted with the responsibility of keeping track of the latest developments in nuclear, radiological and conventional safety and environmental regulations.

The following is a selective list of references on safety standards and regulations.

References

(1) IAEA Safety standards series No. GS-R-1, Legal and Governmental Infrastructure for Nuclear Radiation, Radioactive Transport safety, IAEA, 2000.
(2) IAEA Safety series No. 7S-INSAG-4, Safety Culture, IAEA, 1991.
(3) Basic Safety Principles for Nuclear Power Plants, 75-INSAG-3 Rev.1, INSAG-12, IAEA, 1999.
(4) Management of Operational Safety in Nuclear Power Plants, INSAG-13, IAEA,1999.
(5) IAEA-TECDOC-1254, Training the staff of the regulatory body for nuclear facilities: A competency framework.
(6) AERB Safety Glossary AERB/SG/GLO on Glossary of terms on Nuclear and Radiation Safety.

बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

REGULATORY WORK FOR NUCLEAR FACILITIES IN BARC

Industrial Hygiene Surveillance Activities at BARC : An Overview

D.K. Ghosh, S. Soundararajan, A. Raju, A.P. Sathe and P.N. Bhat
Radiation Safety Systems Division

Introduction

Activities related to nuclear reactor operations, chemical engineering, metallurgical operations, mechanical operations and bio-medical sciences, in addition to basic research in nuclear programmes, are carried out in BARC. Industrial hygiene and safety practice is given equal footage along with radiological safety practice. This culture is instilled in every programme of the research centre right from the design stage itself. The basic principles used in radiation protection, namely, justification of the operation, keeping the exposure to hazard as low as reasonably achievable and not allowing it to exceed the prescribed limits, are adopted, in controlling hazards, arising due to non-radiological operations as well.

The Industrial Hygiene and Safety Section, RSSD, is entrusted with the responsibility of maintaining the surveillance of various operations carried out at BARC, from the point of view of health and safety, against conventional hazards. This article presents an overview of the industrial hygiene surveillance activities carried out at this research centre.

What is industrial hygiene?

Industrial hygiene is a multidisciplinary field of science and engineering that has control of occupational hazards as its primary objective. The American Industrial Hygienists Association defines the subject comprehensively as –

"That science or art devoted to the anticipation, recognition, evaluation and control of those environmental factors (stresses) arising in or from the workplace which may cause sickness, impair health and well-being, or significant discomfort among workers or among citizens of the community."

Anticipation and recognition of hazards require a thorough knowledge of the following aspects:

- Materials handled,
- Process and equipment involved,
- Design and operating parameters,
- Facilities available and
- Past experience.

Many well-developed techniques are available for identification of hazards.

Evaluation of hazards in a work environment requires regular monitoring of work-atmosphere. Monitoring can be carried out using

- direct reading instruments and/or
- air sampling and analysis.

Excess exposure to hazardous agents can cause ill health. To prevent this, guideline values have been prescribed. The measured values can be compared with these guideline values. Different guideline values such as Threshold Limit Value (TLV), Maximum Allowable Concentration (MAC), and Permissible Exposure Limit (PEL) are well known. Amongst these, TLVs are widely used. American Conference of Governmental Industrial Hygienists, a non-profit making body, prescribes these values every year.

A number of hazard control measures are available. These control measures are classified into three major classes, namely; Engineering Control Measures, Personal Control Measures and Medical Control Measures. The most appropriate ones are to be chosen and incorporated to control hazards in a work place.

Industrial Hygiene Surveillance Programme

The mandate of industrial hygiene surveillance at BARC includes

- implementation of hearing conservation programme,
- illumination measurements at workplaces,
- ventilation surveys,
- chemical sampling and surveillance in occupational environment,
- scrutiny of new project proposals from health and safety point of view and conducting induction and need-based industrial hygiene training programmes.

Hearing conservation programme

Industrial noise is prevalent in many industrial activities and causes great concern, as its health impairment hazard is well-proven and at many a times is insidious in nature. Several acts and rules have been passed on this aspect the world over. Limits on noise exposure and guidelines on procurement of equipment, with regard to noise at source, have been stipulated in the Environment Act 1986 and the Noise Pollution (Control and Regulation) Rules 2000. As per the Factories Act 1948 (as amended in 1987), noise induced hearing loss (NIHL) is a notifiable disease listed in the Schedule-3 of the Act. At our centre, a comprehensive hearing conservation programme is in vogue. This comprises identifying high noise level locations through noise - level surveys, implementation of control measures, audiometry as part of medical examination and educative programmes. IHS Section of RSSD collaborates with the Medical Division and the user Division to implement this programme.

What is noise?

Noise is unwanted sound. Sound is a form of vibration that has a frequency in the audible range of 20 Hz to 20000Hz. Technically, noise is defined as the class of sounds, which does not exhibit defined frequency components, but comprises a frequency spectrum of energy, that may produce hearing impairment, in an individual exposed to it.

Effects of Noise

Exposure to high noise levels may induce auditory or non-auditory effects on the individual. These effects are

1. Auditory effects: Noise Induced Hearing Loss [NIHL], acoustic trauma;
2. Non-auditory physiological effects: nausea, reduced muscular control, blood pressure changes;
3. Psychological effects: startle, annoyance/ irritation, disruption of concentration, sleep or relaxation; and
4. Interference with oral communication.

A relative unit in logarithmic scale called 'decibel' (dB) is used to express sound pressure levels. Decibel is the logarithmic ratio of actual sound pressure to a reference sound pressure and hence is called 'sound pressure level'. The reference sound pressure corresponds to the faintest sound perceivable by the normal human ear and is taken as 0.0002 dyne/cm^2 or 0.0002 μbar or 20 μPa. The sound pressure level (SPL) at a given place is defined as

$$SPL = 20 \log (p/p_0) \text{ dB}$$

Where : p is the sound pressure at a given place, and p_0 is the reference sound pressure (0.0002 dyne/cm^2).

The noise level is directly measured in dB by a sound level meter. The instrument essentially consists of a microphone, amplifier, weighting networks and an indicating meter. The 'A' weighting network is often used, as its frequency response is similar to that of human ear and the sound pressure level values obtained using this network, is referred to as dBA.

Noise level surveys and control measures

Extensive noise level surveys using precision integrating Sound Level Meters, have been carried out at this Centre and high noise locations and operations identified. General and specific control measures were suggested. Some of these are given below:

- Providing suitably designed operator's cabin at Central Air-conditioning Plant and the compressor areas of Cirus and Dhruva facilities (By this a reduction of about 20 –25 dBA could be achieved at operator's occupancy area).
- Lowering of RPM of the rod-straightening machine at AFD resulting in a reduction of about 3 dBA
- Use of earplugs or ear muffs at areas of noise level above 85 dBA, even when operator's presence is only for a small duration
- Audiometry as part of periodic medical examination for personnel working in locations where the noise levels are above 85 dBA.

Illumination Measurements

Adequate and good lighting is essential at workplace and in many instances is crucial for safety. The Indian Standard IS: 6665-1972 on '*Code of practice for Industrial Lighting*' prescribes guideline values of illumination at different premises of an industry. Rule 11 of Atomic Energy (Factories) Rules 1996 [AEFR] stipulates the required illumination values in lux for various locations/operations. These values are in line with the Indian standard and have been adopted at this Centre.

Illumination measurements are done with the help of light meters at various workplaces. These include machine shops of Centre for Design and Manufacture, nuclear research reactors such as Cirus and Dhruva, chemical plants like fuel reprocessing and uranium extraction facilities. Appropriate recommendations are prescribed. Some characteristics of good lighting are : adequate quantity of illumination, uniformity, avoidance of glare, appropriate contrast and good colour scheme for the walls and ceiling.

Ventilation Surveys

Ventilation is an important engineering hazard control measure, where chemical stress and/or thermal stress are anticipated. Some of the locations/processes, where ventilation is a key safety feature are: electron beam accelerators, linear accelerators, gamma irradiators, radiological laboratories and beryllium operations. Stipulations on the number of air-changes given under Rule 11 of Atomic Energy (Factories) Rules 1996, are used as guideline values.

Ventilation surveys are carried out to determine the available number of air-changes per hour and to check whether the design values are met with. The face velocity is checked for all the laboratory fume-hoods provided in the chemical laboratories, to ensure that, the minimum face velocity of 0.5 m/s is maintained.

Chemical Safety Surveillance

Chemicals in small as well as bulk quantities are handled at this Centre. The stipulations given in Rule 88 of AEFR and the schedules given thereunder, the Factories Act 1948 and the schedules 1 to 3 of the Act, the Environment Act 1986 and the various Rules framed under the provisions of this Act are followed. The Threshold Limit Values [TLV] recommended by the American Conference of Governmental Industrial Hygienists [ACGIH] are used as guideline values for limiting occupational exposure.

Chemical safety surveillance provided by the Section includes

- Dissemination of information on
  - Hazards of the chemicals,
  - Safe handling and storage,
  - Personal protective equipment,
  - Safe disposal procedure and
  - Occupational exposure limits.
- Sampling and analysis of air, swipe and process effluent at workplaces
- Scrutiny of new proposals for chemical safety aspects.

The Section maintains a CD-ROM database on Material Safety Data Sheets [MSDS] for tens of thousands of chemicals. This CD-ROM database is obtained from the Canadian Centre for Occupational Health and Safety [CCOHS] on a renewable annual subscription basis.

Routine and specific sampling and analysis to determine occupational concentration of the toxic chemicals are carried out. In addition to this, the Section provides comprehensive industrial hygiene surveillance at the Beryllium Facilities of BARC Complex, Vashi, Navi Mumbai.

Industrial hygiene aspects are considered and incorporated right at the design stage of the project proposals, which are thoroughly scrutinized from the point of view of health and safety.

Industrial hygiene related R & D programmes have been an integral part of this Section's work. Information bulletins, booklets and manuals on various industrial hygiene related aspects have been released by this Section. Working in tandem with the user Divisions and the Medical Division and with the cooperation and consistent support of the top management, this Section maintains a high quality industrial hygiene surveillance programme.

Industrial hygiene survey at Centre for Design and Manufacture during plasma cutting operation for estimation of ozone and NOx

Beryllium samples analysed using AAS at BARC Complex, Vashi

बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

FACULTY - STUDENTS - SCIENTISTS MEET AT NEW DELHI & GOA

On the dais from left to right are : Dr B.N. Jagtap, L&PTD, BARC, Dr R.R. Puri, Head, HRDD, BARC, Mr R.K. Sharma, Head, MR&PAS, SIRD, BARC and Dr Jai Prakash, Vice Principal, Ramjas College, New Delhi

The Media Relations & Public Awareness Section, Scientific Information Resource Division, BARC, conducted specially designed public awareness programmes at Delhi and Goa as part of the celebrations of the International Year of Physics.

At the Physics Department, Delhi University the programme was organised on September 28, 2005 in which 350 post graduate students; research scholars & faculty members participated. At Ramjas College, Delhi, 300 students & faculty members attended the programme.

Dr B.N. Jagtap, L&PTD, BARC, Dr V.M. Datar, NPD, BARC, Dr R.R. Puri, Head, HRDD, BARC & Mr R.K. Sharma, Head, MR&PAS, SIRD, BARC, delivered talks covering the following topics :

1. Life & Science of Einstein,
2. Bose-Einstein condensation,
3. Pure & applied research work in Physics at BARC,
4. Nuclear power in India & career opportunities in DAE and
5. BARC spin-off technologies & radioisotopes in healthcare, industry & agriculture.

The Pro Vice-Chancellor, Delhi University, stressed the need for continuous interaction between R&D organizations like BARC and academic institutions.

BARC also organised two Faculty-Students-Scientists Meet programmes at INS Mandovi, Verem and Dhempe College, Goa University, Goa.

The programme at Dhempe College was organised on October 15, 2005 in which 150 Final Year B.Sc. students & faculty members participated. On October 17, 2005 a special programme was organised for 300 Officers and Cadets of INS, Mandovi. BARC scientists Dr A. Ramaswami, Ms Chhavi Agarwal, Dr Kanchhi SIngh, Dr Pradeep Kumar and Mr. R.K. Sharma, delivered talks on :

1. Introduction to radioactivity and practical demonstration on radioactivity measurements
2. Nuclear power, preparedness for response to nuclear and radiological disaster and
3. BARC spin-off technologies & isotopes in healthcare, agriculture and industry.

Captain Rao, Commandant of the INS Mandovi expressed interest to organize such programmes every year, for the upcoming Naval Officers to keep them abreast of new developments in nuclear reactors and various technologies developed by DAE.

बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

GRADUATION OF TRAINEES OF ONE YEAR HEALTH PHYSICS STIPENDIARY TRAINING COURSE-X BATCH

On the dais from left to right are Mr M.L. Joshi, Head, HPD, BARC, Dr S. Banerjee, Director, BARC & Mr H.S. Kushwaha, Director, HS&EG, BARC

The Health Physics Division has been conducting training for Science Graduates through its One year Health Physics Stipendiary Training Course since 1989, to provide scientific assistants trained in Health Physics profession, required for the Nuclear Fuel Cycle facilities, of the department. The valedictory function of the X batch of the training course in this series, consisting of 35 Science graduates recruited by BARC and NPCIL, was held on June 30, 2005 at HPD auditorium, CT&CRS Building, Anushaktinagar. Dr S. Banerjee, Director, BARC delivered the valedictory address and awarded certificates to the successful candidates. Mr H.S. Kushwaha, Director, HS&EG, Dr Om Pal Singh, Secretary, AERB and Mr M.L. Joshi, Head, HPD were the other dignitaries present at the function.

The valedictory function commenced with a welcome address by Mr M.L. Joshi, Head, Health Physics Division. He gave a brief outline of the course and explained the relevance of the training programme, which was intended to prepare the new entrants, ready to shoulder the responsibility of radiological safety, in various nuclear fuel cycle facilities including Nuclear Power Plants. He also explained that the Health Physicists stationed at these facilities, are also expected to perform the duties of the regulatory authority. Mr M.L. Joshi expressed happiness that the Director, BARC could spare time to attend the function and address the new Scientific Assistants, course coordinators and the faculty inspite of his busy schedule. This indicated the importance given to the training activities in the department.

Mr H.S. Kushwaha, Director, Health, Safety & Environment Group, BARC in his introductory remarks, welcomed the youngters to the family of HS&EG and reminded them of the responsibilities of a professional Health Physicist, especially in the light of the growing awareness on safety and higher standards, set by the regulatory authority.

He also reminded them, that the one year training was only the beginning of their education in the field of nuclear technology and that they have to learn more of the engineering aspects such as plant process and systems, instrumentation and control systems, computer codes used for safety evaluation, latest in Health Physics Instrumentation and new and more sensitive analytical techniques. He also stressed, on the role and responsibility of the safety personnel, to enforce guidelines, issued by the regulatory authority and to assist the plant management, in operating the units, within predetermined and approved

parameters. He advised them to work as ambassadors of safety and help build public confidence on the safety of nuclear technology and also to ensure environmental protection. He also emphasised the need to report scientific observations and results in standard formats followed everywhere. In this context, he also stressed the need for taking up R&D activities which are relevant to the field of radiological safety and help in achieving higher standards of safety. He also advised them to keep abreast of the latest developments in the field of nuclear science and technology and to apply this knowledge for improving the work output by developing better skills and techniques.

In his valedictory address, Dr Srikumar Banerjee, Director, BARC appreciated the Health Physics training programme especially for its syllabus and the structure of the training course. He remarked that this course comprised of a wide spectrum of subjects on science and engineering and is a unique one covering the requirement for the entire nuclear fuel cycle facilities. He also remarked that in the expanding field of nuclear technology, trained and qualified Health Physics professionals would be in demand and reminded the youngsters of their responsibilities in ensuring safety. The overall safety should be focused on the safety of the plant, plant personnel, general public and the environment. For achieving these objectives, a safety professional should maintain a positive attitude and should not assume the role of "policing" for enforcing safety. The approach should be to educate the workers and to develop a safety culture in every unit and facility.

He further commented that the role of a professional health physicist should be like that of preventive medicine. He should be able to foresee the risks, prepare scenarios and keep himself and the other staff ready for handling any untoward situations. As an example, he quoted the relevance of conducting training workshops on Planning, Preparedness and Response to Radiological Emergencies periodically.

After the valedictory address, Director, BARC awarded certificates of successful completion of the training programme to the individual trainees.

Dr Om Pal Singh, Secretary, AERB also addressed the gathering. He expressed happiness for being invited for the occasion and for being asked to present the awards to the merit holders, on behalf of AERB. In his address, he reminded the trainees of the importance of learning, applying the knowledge gained to their field of work and analysing their job practices for incorporating further improvements and developing a proper work culture. He also appreciated the fact that Health Physics professionals and officers of RP&AD were assisting AERB in its regulatory functions. He urged the trainees to continue their education and to apply their knowledge for developing better safety standards; especially in the light of the fast expansions proposed in the field of nuclear power generation. The AERB awards for the 1st and 2nd rank holders were presented by Dr Om Pal Singh to Kum. Devashree Dutta and Mr Manoj Kumar Saini respectively.

The function concluded with a vote of thanks proposed by Mr K. Narayanan Kutty, OIC, Training Group, HPD. On behalf of the Training Group and other members of HS&EG, he expressed gratitude to Director, BARC for sparing time to attend the function and address the gathering. He also appreciated the guidance and help received from seniors from time to time and for the co-operation of a large number of agencies, in successful completion of the training programme. He had a word of appreciation for the excellent arrangements provided for "On the Job Training" at different facilities of DAE and that each one of the facility was selected to provide insights on a particular aspect of nuclear fuel cycle operations. He emphasised the importance of team work and expressed happiness over the encouragement given by AERB, in presenting the awards to the merit holders of the past batches. He also hoped that this gesture, as an appreciation for merit, would inspire the training professionals, to work with more dedication and to enable them, to provide better qualified scientists who will be prepared to shoulder the responsibilities of the ongoing and future programmes of the department.

बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

CONFERENCE REPORT ON FOURTEENTH NATIONAL SYMPOSIUM ON ENVIRONMENT (NSE-14) HELD AT OSMANIA UNIVERSITY, HYDERABAD

On the occasion of the world environment day, the Department of Physics, Osmania University and Health, Safety and Environment Group, Bhabha Atomic Research Center (BARC), Mumbai, India jointly organized the fourteenth National Symposium on Environment (NSE-14) in collaboration with the Uranium Corporation of India Ltd., Atomic Minerals Directorate for Exploration and Research, Nuclear Fuel Complex and the Electronics Corporation of India Ltd., during June 5 – 7, 2005 at Hyderabad. The focal theme was "Water Resources and Environment", as maintaining a high quality of water resources, is a prime requirement for green cities. More than 100 research contributions on various topics were received and nearly 60 contributed papers were accepted for oral and poster presentations, after peer review.

Mr Narayani Narasimha Reddy, Minister for Technical Education, Government of Andhra Pradesh inaugurated the three-day long deliberations while Dr. Anil Kakodkar,

At the valedictory function seen on the dais from left to right are : Mr V.D. Puranik, Head, Environmental Assessment Division, BARC, Prof. Suleman Siddiqui, Vice-Chancellor, Osmania University, Prof. K. Rama Reddy, Osmania University and Mr P. Yadagiri Reddy, Convenor of the symposium.

Chairman, AEC and Secretary, DAE was the chief guest for the inaugural function. Prof M.Mutha Reddy, Registrar, Osmania University presided over the function. In his inaugural address, the Minister for Technical Education emphasized the need for a pollution-free India, for conserving water and for reducing air pollution. Dr Anil Kakodkar in his address highlighted India's nuclear programme and said that, efforts should be made, on the use of available resources to an optimum level and to evolve newer, effective technologies for recycling. Mr V.D.Puranik of the Environmental Assessment Division, BARC elaborated on the theme of the conference. Prof. K. Rama Reddy of Osmania University, Hyderabad shared his experiences with the audience in the establishment of the Environmental Assessment Laboratory at the Department of Physics, Osmania University. Prof. U.V. Subba Rao, Head of Physics Department, in his address reported the research activities of the department and its future plans. The president of the inaugural function, Prof. Mutha Reddy gave his remarks on the symposium. Dr P.Yadagiri Reddy, Convener of the symposium, concluded the inaugural function after a vote of thanks. For the first time, the conference proceedings were brought out as a special edition of a scientific journal.

The three-day deliberations were grouped into nine scientific sessions with two invited talks and some contributed papers in each session. In his invited talk, Mr H.S. Kushwaha, Director, Health Safety and Environment Group of BARC stressed the need for environmental surveillance around nuclear facilities and to check compliance with radiation exposure limits, set for the public. This is achieved through the establishment of environmental survey laboratories around each of the operating nuclear power plants in India. He also discussed the surveillance carried out by the laboratories around nuclear power plants in India and the dose received by the public at some facilities. He pointed out that the annual dose received by public at the site boundary of 1.6 km has been only a small fraction of the dose limit prescribed by the Atomic Energy Regulatory Board.

In his invited talk Mr R. Gupta, Chairman and Managing Director of the Uranium Corporation of India Ltd., reviewed mining and processing of uranium ore, waste management, effluent treatment and environmental protection with special reference to UCIL operations at Jaduguda and that of Ranger mines in Australia & Mc. Clean lake in Canada Corporation. He said that the impact on the environment due to uranium ore mining and processing operations of UCIL is negligible. According to him, our environmental management systems are at par with any leading uranium industry in the world.

Mr S.M. Rao, Deputy Chief Executive of Nuclear Fuel Complex, Hyderabad spoke about the environmental management methodologies being practiced at NFC. Mr A.Ramakrishna of AERB presented the regulatory and safety aspects of Indian nuclear power programme. He pointed out that constant follow-up on review of safety operations through various mechanisms of AERB has helped a long way in enhancing safety. In his presentation, Dr A.R. Reddy, former Director, Defense Lab, Jodhpur summarized the radiation protection philosophy and the role of ICRP and other expert bodies, in connection with the risks due to radiation exposure, by the operation of nuclear power plants. Dr. R.N. Singh, former Director of NEERI, covered the historical perspective of ground water modeling for environmental protection.

Mr M. Raghavayya, retired senior environmentalist from BARC talked about radiation protection in the uranium mining and milling industry, with special reference to UCIL, Jaduguda. Mr Raghavayya pointed out that although the uranium content of most of the uranium ores is low, the radiological hazards involved in the mining and milling of the ore, are by no means insignificant. Due to long-term operations, uranium industry's impact on the environment can be significant, unless adequate precautions are taken not only during the operations, but also during the planning stage itself. Provided all safety precautions are taken care of as envisaged in the ICRP system of dose limitations,

this part of the nuclear fuel cycle can be easily managed with confidence so that workers, members of the public and the environment are not at risk.

In his presentation Mr S.P. Chaganty of ECIL gave an review of the environmental monitoring systems for radioactivity developed by ECIL and installed at various nuclear power plants in India. Mr A.G. Hegde of Health Physics Division, BARC gave an overall evaluation of water quality parameters and associated environmental factors at nuclear power plants, operating at Kaiga and Tarapur. According to one of his studies, the environmental impact of nuclear power plants on water resources including thermal pollution is found to be insignificant. There is no increase in the fission product activity in drinking water samples around TAPS even after 30 years of operation and the activities recorded are due to global fallout only. The dose due to tritium intake through drinking water is also found to be very small. In his presentation, Mr G.K. Rao of Hyderabad Metropolitan Supply and Sewerage board of Hyderabad reviewed the contribution of the Hyderabad Metropolitan Water Supply and Sewerage Board, in maintaining water quality and environmental sustainability of the twin cities of Hyderabad and Secunderabad.

In his presentation Mr V.D.Puranik of Environmental Assessment Division, BARC gave a review of the natural and environmental background radiation exposures. He showed that major contribution of radiation exposure sources to the Indian population are due to natural background radiation and medical exposures. In India, the total annual effective dose from both natural and man-made sources works out to be 2.39 mSv. Out of this, 96.7% contribution is caused due to natural sources. Modified sources contribute 0.052%; atmospheric nuclear explosion contributes 1.88 %; medical exposure 2.1 % and operation of nuclear power plants 2.09 x 10^{-3} %. In his presentation, Dr. P. Shahul Hameed of the Environmental Research Center, Vallam, Tanjavur summarized the environmental radioactivity profile of the south east coast of India. Dr S. Q. Hoda, Ex. Regional Director, AMDER, Shillong presented emerging scenario and environmental viewpoint on

**Photograph at the release of the symposium proceedings from left to right are :
Mr V.D. Puarnik, Head, Environmental Assessment Division, BARC, Prof. U.V. Subba Rao, Head of Physics Department, Osmania University, Dr Anil Kakodkar, Chairman, AEC, & Secretary to Government of India, Prof. M. Mutha Reddy, Registrar, Osmania University, Mr Narayani Narasimha Reddy, Minister for Technical Education, Government of Andhra Pradesh, Prof. K. Rama Reddy, Osmania University and Dr P. Yadagiri Reddy, Convener of the symposium**

the ground water resources of northeast India. He informed the audience that the potential of ground water in northeast India has so far remained mostly untapped, due to plentiful availability of sources of surface water resources.

In his talk, Dr P. K. Tewari of the Desalination Division, BARC gave an overall view of the role of desalination and water purification in meeting water requirements. Dr. Gurdeep Singh of Indian School of Mines, Dhanbad reviewed water sustainability through augmentation of underground pumped-out water for potable purposes, from the coal mines of eastern India. Dr M.A.R. Iyengar of Department of Environmental Sciences, Bangalore University, Bangalore summarized the environmental radioactivity aspects of the marine environment. Dr P. Yadagiry Reddy, of Osmania University reviewed the indoor radiation levels in the proposed uranium mining areas of Andhra Pradesh while Mr A.H. Khan of the Environmental Assessment Division, BARC reviewed the management of uranium mill tailings.

In the first session of the oral presentations, papers dealing with background radiation surveillance around Kudankulam, Meiotic consequences in Echinops growing on uranium mineralized area of Jharkhand were discussed. Impact of geo-chemical environment of subsurface water on the water measurement of ultra trace levels of uranium in ground water and pre-operational radiological monitoring around proposed uranium mining and ore processing site at Tummlapalle, Andhra Pradesh were discussed in detail in the second session. Papers on probabilistic-fuzzy modeling approach for addressing uncertainty in health risk assessment and multiple area source model to evaluate the ground water quality at radioactive waste disposal sites were covered in session III. In session IV, issues pertaining to measurement of dissolved radon levels in hydrosphere of uranium mineralized area of Jaduguda and the effect of mining pollutants, on seasonal variation of zooplankton and physico-chemical parameters around Raitollem lake, Goa, were discussed.

In session V, papers on estimation of uranium in various types of water and sand samples, natural radioactivity in a major river of coastal Karnataka and impact of treated effluents released from processing of radioactive minerals on the aquatic environment of Periyar river were discussed in detail. Papers on inhalation dose estimates in urban Hyderabad area and studies on water quality parameters due to operation of PHWR at KAPS were in the sixth session. In session VII, the topics covered were : dissolved oxygen profile in the vicinity of thermal outfall of MAPS, Kalpakkam, turbidity of the atmosphere and water at major ports of India and physico-chemical parameters of brine at different stages of various salt-pans of Kanyakumari. Session VIII touched upon papers relating to shore and offshore monitoring of Rana Pratap Sagar Lake, removal of Cu (II), Ni (II), Co (II) and Zn (II) ions from aquatic solutions using modified silica gel and signature of active and break phases of Indian summer monsoon in subsurface agro data. In session IX, topics included reduction of nitrate in aqueous waste, development of a stirring rate system for better performance of an anaerobic sequencing batch reactor and treating low strength wastewater.

Environmental benefits of nuclear energy and radioactive waste management in Indian nuclear power plants; kinetic model for the sorption of phenol from aqueous solution by clay were discussed in the last session. There were 35 poster presentations on various subjects such as environmental radioactivity monitoring in air, water, soil and beach sands; water quality monitoring around nuclear power plants; trace metal concentrations in drinking water; association of radium in naturally occurring radioactive materials; indoor radon levels around coal mine environment etc.

The valedictory function was chaired by the vice-chancellor of Osmania University, Prof. Suleman Siddiqi. He congratulated the organizers for organizing the conference and selecting a highly relevant topic as the focal theme of the conference. He also emphasized the role of the public in maintaining the environment clean and green.

बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

DAE - BRNS SYMPOSIUM ON ELECTRON BEAM TECHNOLOGY AND APPLICATIONS: SEBTA 2005

The Beam Technology Development Group, BARC, in association with the Power Beam Society of India organized the DAE-BRNS Symposium on Electron Beam Technology and Applications (SEBTA 2005) at the multipurpose hall of the BARC training school hostel, Anushaktinagar, during September 28–30, 2005. The symposium was inaugurated by Dr B.A. Dasannacharya, Former Director, Inter-University Consortium for DAE facilities, Indore. In his inaugural address, Dr Dasannacharya recalled the scientific discoveries on electron beams in the beginning of the 20th century and exhorted the participants, to devote time for scientific research work on electron beam development, for understanding the physics of beams and for newer ideas and applications, apart from the technological developments in the field. In his opening remarks, Dr A.K. Ray, Director, Beam Technology Development Group, BARC mentioned that development work on electron beam systems at BARC, has reached a stage, where it has produced very reliable and user compatible

Dr B.A. Dasannacharya, Former Director, Inter-University Consortium for DAE facilities, Indore, inaugurating the exhibition. Others (from left to right) : Mr D.P. Chakravarthy, Convener, Dr L.M. Gantayet, Chairman, Symposium Organizing Committee and Dr A.K. Ray, Director, Beam Technology Development Group, BARC.

Dr B.A. Dasannacharya, Former Director, Inter-University Consortium for DAE facilities, Indore, inaugurating the symposium. Sitting on the dais from left to right are : Mr D.P. Chakravarthy, Convener, Dr A.K. Ray, Director, Beam Technology Development Group, BARC, Dr L.M. Gantayet, Chairman, Symposium Organizing Committee and Dr Archana Sharma, Co-convener.

electron beam welding systems for the industry. He also mentioned about the rapid strides being made in the development of industrial type electron beam accelerators by BARC and other institutes in the country and their impact on the industry especially, in the context of a number of materials processing applications. Earlier Dr L.M. Gantayet, Head, Laser and Plasma Technology Division and Chairman, Organizing Committee, welcomed the participants, dignitaries and invitees to the symposium. Mr D.P. Chakravarthy, Convener, Organizing Committee, proposed the vote of thanks.

The inaugural session was followed by a brief account of the activities of the Power Beam Society of India by Dr K.C. Mittal, Treasurer, Power Beam Society of India and then there were three talks on the overview of electron beam technology in India. The talks covered the areas of 'EB equipment for thermal and non thermal processing – Indian scenario', by Dr A.K. Ray, ' Applications and technology of electron beam accelerators by Dr R.C. Sethi, Head, Accelerator and Pulse Power Division and 'Electron Beam Equipment development; Four Decades of knowledge base' by Mr A.K. Sinha, former Head, Electron Beam Technology Section, Laser and Plasma Technology Division, BARC. All the three speakers were also felicitated for their outstanding contributions in the field of electron beam technology and applications.

SEBTA was organized in 10 sessions including the inaugural and the concluding sessions on 'Industrial perspective and future steps' The scientific programme included twenty-two invited talks (apart from the three overview

talks and the BRNS talk) and fifty-five contributed papers. All the papers were divided into three main categories:

- Electron Beam Technology : Thermal Applications,
- Non Thermal Applications
- Pulsed Power Applications.

Invited talks were given by well known experts in their respective fields. Six papers from the contributed category were selected for oral presentation in a special scientific session.

The presentations covered a wide spectrum of issues and novel methods including, non vacuum and low pressure electron beam welding for nuclear and non nuclear applications, DC and microwave based electron beam devices, electron gun design, beam modeling and characterization, thin film deposition, surface sculpting, thermal and non thermal processes and applications, high voltage and pulsed power sources and electron beam system maintenance and trouble shooting. Two of the contributed papers were adjudged as the best papers, by a committee constituted by the Symposium Organizing Committee after evaluating the relevance, scientific content and clarity of presentation. The proceedings of the symposium were distributed to all the delegates. A visit to the Electron Beam Centre at Kharghar, Navi Mumbai, also was arranged for the delegates.

The symposium provided a forum for exchange of ideas and information on the latest developments in the field of electron beam technology, both in thermal and non thermal electron beam applications. There were about 310 registered participants from various National Institutions/ Universities/Colleges and industrial houses. The response to this symposium from India and abroad was overwhelming. It was interesting and informative to discuss with scientists and engineers from Pro-beam, Germany, ISF Welding Institute, Germany, VIVIRAD, France, Institute of Electronics, Sofia, Bulgaria, Cambridge Vacuum Engineering, UK, The Welding Institute (TWI) Ltd., UK and Hacettepe University, Turkey. In India apart from BARC, participation was from Nuclear Fuel Complex (NFC), Hyderabad, Centre for Advanced Technology (CAT) Indore, Liquid Propulsion Systems Cente, Indian Space Research Organisation (LPSC-ISRO), Bangalore, Gas Turbine Research Establishment (GTRE), Bangalore, Central Electrical & Electronis Research Institute (CEERI), Pilani, Institute of Plasma Research (IPR), Gandhinagar, Microwave Tube Research and Development Centre (MTRDC), Bangalore, SAMEER, Mumbai, National Thermal Power Corporation (NTPC), Noida, Central Glass and Ceramic Research Institute (CGCRI), Kolkata and Walchand College of Engineering, Sangli. It was also heartening to note that there was an enthusiastic response from the student community. The symposium is likely to generate several collaborative programmes between the Department of Atomic Energy and other institutions in the future.

Industry response to this symposium was also highly encouraging. In view of the industrial significance of the electron beam technology and applications, an exhibition of electron beam technology related equipment, accessories, products etc. by different manufacturers and suppliers, was organized at the venue of the symposium hall. There were 13 participants in the exhibition.

In the concluding session, Dr A.K.Ray thanked all the delegates for the lively three-day discussions.

बीएआरसी न्यूज़लैटर
BARC NEWSLETTER

TECHNOLOGY TRANSFER OF BIPHASIC MEDICAL ELECTROPORATOR

The technology of the "Biphasic Medical Electroporator" developed by the Radiation Biology and Health Sciences Division (RB&HSD), BARC was transferred to M/s. DS Enterprise, Mumbai on October 14, 2005.

This laboratory instrument is a novel bio-medical Electroporator for efficient, easy and rapid delivery/ insertion of bio-molecules, drugs into in-vitro and animal experimental systems for drug delivery, transfection and gene-therapy. It operates by inducing Cell Electroporation, which is the process of formation of ransient micropores in cellular plasma membrane by the application of high intensity, short duration electric field. It generates pulses of amplitude ±450 volts and with a duration of 200 to 300 micro-seconds, at burst frequency of 125 Hz. It operates in both auto and manual modes.

The Technology Transfer & Collaboration Division, BARC, managed all the activities related to the transfer of this technology. It involved evaluation of the technology, documentation of the technology, technology transfer charges, filing for patent protection, announcement of the technology, evaluation and selection of a capable transferee and preparation and signing of the technology transfer agreement. Necessary inputs were provided by RB&HSD, BARC.

Photograph at the time of signing technology transfer agreement, from left to right are : Mr A.M. Patankar, Head, TT&CD, BARC, Mr Devang Mehta, Partner, M/s. DS Enterprise, Mumbai, Mr B.K. Pathak, Head, TTS, TT&CD, BARC, Dr R.B. Grover, Director, KMG, BARC, Dr K.P. Mishra, Head, RB&HSD, BARC and Dr S.H. Sanghavi, Partner, M/s. DS Enterprise, Mumbai.

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भा.प.अ. केंद्र के वैज्ञानिकों को सम्मान
BARC SCIENTIST HONOURED


S.K. Saxena


Dr.(Ms) N.S. Rajurkar


Ramu Ram


S.K. Shrivastava


Dr A. Dash


Dr (Ms) Meera Venkatesh


K.T. Pillai

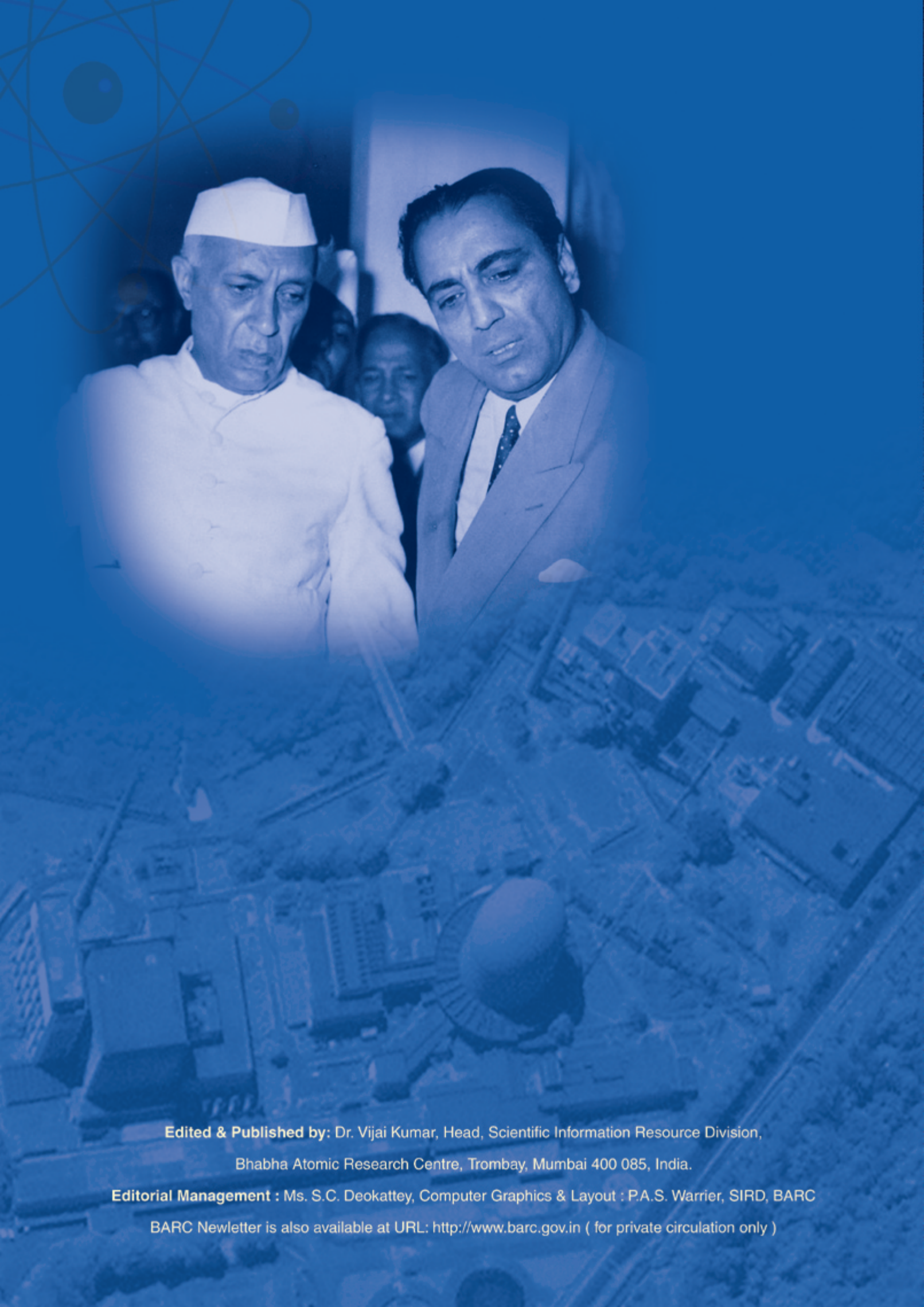
एस.के. सक्सेना, नीलिमा एस. राजुरकर, रामू राम, एस.के.श्रीवास्तव, के.टी.पिल्ले, ए.दाश तथा मीरा वेंकटेश , रेडियोभेषज प्रभाग को स्टडीज ऑन दि एडजॉर्पशन ऑफ ^{125}I ऑन मेटेलिक पेलेट्स फॉर दियर पोटेन्शियल एप्लिकेशन इन बोन डेन्सिटोमीटरी फॉर दि डाइग्नोसिस ऑफ आसटियोपोरोसिस नामक शोध-पत्र के लिए इन्डियन न्यूक्लियर सोसाइटी की 16वी वार्षिक संगोष्ठी के दौरान सर्वश्रेष्ठ (पोस्टर) पुरस्कार से सम्मानित किया गया। नवंबर 15-28, 2005 के दौरान बहुप्रयोजन हाल, प्रशिक्षण केंद्र हॉस्टल, अणुशक्तिनगर, मुंबई - 400 094 में आयोजित इस संगोष्ठी का मुख्य विषय साइन्स बिहांइड न्युक्लियर टेक्नॉलोजी था।

The paper entitled, "Studies on the Adsorption of ^{125}I on Metallic Pellets for their Potential Application in Bone Densitometry for the Diagnosis of Osteoporosis" , authored by S.K. Saxena, Nilima S. Rajurkar, Ramu Ram, S.K. Srivastava, K.T. Pillai, A. Dash and Meera Venkatesh of Radio-pharmaceuticals Division was given the best paper (Poster) award during Sixteenth Annual Conference of Indian Nuclear Society (INSAC-2005). The theme of the conference was 'Science Behind Nuclear Technology' and it was held at the Multipurpose Hall, Training School Hostel, Anushaktinagar, Mumbai - 400 094 , during November 15 -18, 2005.


Ramesh K Satdive

रमेश के. सत्दिवे, देवानन्द पी. फुल्जेले एवं सुजेन ईपन, नाभिकीय कृषि एवं जैव प्रौद्योगिकी प्रभाग, भाभा परमाणु अनुसंधान केंद्र को नवंबर 18-20, 2005 के दौरान सेंट्रल इन्सटिट्यूट ऑफ मेडिकल एंड एरोमेटिक प्लाँटस, लखनऊ में आयोजित नैशनल सिम्पोजियम ऑन प्लाँट - 1 टेक्नॉलॉजी न्यू फ्रन्टीयर्स पर सिन्थीसिज ऑफ अजादिराचटिन बाई ट्रान्सफोरम्ड रूट कल्चर्स ऑफ अजादिराचटा इन्डिका नामक शोध-पत्र की पोस्टर प्रस्तुति के लिए तृतीय पुरस्कार से सम्मानित किया गया।

The paper entitled "Synthesis of azadirachtin by transformed root cultures of Azadirachta indica" authored by Ramesh K. Satdive, Devanand P. Fulzele and Susan Eapen of Nuclear Agriculture and Biotechnology Division, BARC, was awarded the third prize for poster presentation at "National Symposium on Plant Biotechnology : New Frontiers" held at Central Institute of Medicinal and Aromatic Plants, Lucknow, during November 18-20, 2005.



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