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SRESA Newsletter

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New

A Report on 2nd International Conference on Reliability, Safety and Hazard–ICRESH-2010

From the President's Desk

The Society for Reliability and Safety (SRESA) has been formed to facilitate sharing of the ideas and experiences from the work performed in different organizations involved in reliability and safety. SRESA was one of the organisers of the 2nd International conference on Reliability, Safety & Hazard (ICRESH-2010) held during 14-16 December, 2010 in Mumbai. I would compliment Shri R. C. Sharma, Convenor-ICRESH-2010 and Head, RRSD, BARC for doing a wonderful job as he steered the organizational activities of the conference right since its inception. Over 100 contributed papers were presented along with 25 key note lectures during this conference. A two day pre-conference tutorial session covering PSA in support of regulatory applications & 'Physics-of-Failure' methods for reliability prediction of electronic components was also organized. SRESA has also presented life time achievement awards to five distinguished personalities for their invaluable contribution in the field of reliability and safety. Response received to these events was highly encouraging. As a part of its activities, SRESA publishes periodically a newsletter, which covers upfront areas in the field of reliability and safety. The first issue was brought out during the ICRESH-2010. This is the second issue of newsletter of the society. There are three articles featured in this issue. The first articles presents a report on ICRESH-2010, the second presents the activities of NPCIL in the area of PSA. A brief overview of recently held symposium NRT-4 has also been presented. Keeping in view the objective of the society related information forms part of this issue.

Dr. S. K. Gupta

Inside this issue:

International Conference, on Reliability, Safety and Hazard- ICRESH-2010

Research and development work in the area of reliability, safety and risk based applications is being actively pursued all over the globe with an overall objective of performance improvement and optimisation of O & M costs in nuclear as well as process plants. In DAE extensive work in the areas of probabilistic safety assessment, risk based applications, etc. is being carried out. Keeping in view the need of bringing the experts in these fields from India and abroad on a single platform to have discussions, presentations, sharing of experiences and exchange of ideas, the second International Conference on Reliability, Safety and Hazard-2010 with a theme Risk based technologies and Physics-of-failure methods was held in the month of Dec 14-16, 2010 at Hotel Four Points, Vashi. The objective of this conference was to provide a forum to the participants for technical discussions on recent developments in the area of risk-based approach and role of physics-of-failure methods in decision making. The main features of the conference were i) Participation of international organizations like CALCE, USA; IEEE-Reliability Society, and many other reputed institutes in organization of the conference. ii) Publication of the conference proceedings by IEEE. iii) Organisation of a preconference tutorial. The first conference in the series i.e. ICRESH-2005 was held during Dec 2005 was also a grand success.

The ICRESH-2010 was inaugurated by Dr. S. Banerjee, Chairman, Atomic Energy Commission and Secretary to Department of Atomic Energy and Presided over by Dr. R. K. Sinha, Director, BARC. Prof. Michael Pecht, Director CALCE, University of Maryland, USA, was the guest of honour. Shri V. K. Raina, Director, Reactor Group, BARC & Chairman (General) delivered the welcome address and Shri H. S. Kushwaha, Conference Chairman and Ex-Director, Health, Safety & Environment Group, BARC gave introductory remarks. Prof. A. K. Verma, IIT Bombay released the conference souvenir and Dr. P. V. Varde, Conference Secretary gave vote of thanks.

The conference received an overwhelming response from national as well as international organisations. The experts and delegates from different parts of the world contributed in the conference which, apart from India include, USA, UK, Australia, Sweden, South Korea, Singapore, Argentina, Germany, et. al.

Pre-Conference Tutorial

A pre-conference tutorial was held during Dec 12-13, 2010 at Training School Complex, Anushaktinagar. On the first day the topic covered was Introduction to Level-1, Level-2 and Level-3 PSA. Dr. Sanyasi Rao, BARC covered the introduction to Level-1 PSA and Dr. V. Mubayi from Brookhaven National Laboratory, USA, covered Level-2 and Level-3 PSA and the regulatory applications.

Dignitaries on the dais during inaugural session of ICRESH-2010

Dr. S. Banerjee, Chairman AEC, delivering his inaugural address.

Dr. R. K. Sinha, Director, BARC, delivering his presidential address

Mr. V. K. Raina, Chairman ICRESH-2010 & Director RG, BARC delivering welcome address.

Audience during ICRESH-2010

On the second day Dr. Diganta Das from Center for Advanced Life Cycle Engineering (CALCE), University of Maryland, USA covered an interesting topic on 'Physics-of-failure and reliability Prediction for Electronic Components'. The tutorial was attended by around 50 participants from DAE and private institutions and it was very much helpful to them. Lecture notes of both the tutorials were compiled and provided to all the participants.

Dr. Diganta Das, CALCE during the tutorial session

Conference Technical Programme

The conference technical committee received around 130 papers in the specified areas and the same were included in the conference proceedings after a two tier review by the experts. Apart from this, around 20 key note addresses and 25 invited talks were delivered by eminent invited speakers. The key note addresses were very much appreciated by the audience. The proceedings of the conference were organised in three parallel sessions in which the authors presented their work. A souvenir book was brought out containing detail technical programme, abstracts of key note addresses and a brief introduction of the key note speakers.

Major outcome of the Conference

Based on the presentations and discussions following areas were identified as the thrust areas for future research and development work.

1. Though the PSA methodology has matured enough to address many applications dealing with prioritisation of activities, identifying areas for improvements, design review and optimisation, etc. there is still scope for development of plant specific component reliability databases. Efforts should be made to establish an integrated database management system which facilitates apart from data collection, data elicitation and analysis so that uncertainty in data could be minimised.

2. The conventional tools are not adequate to model uncertainty in data and models. There are some scenarios, when the data is not available or only limited data available to quantify an event. It was felt that apart from probabilistic methods, fuzzy logic approach, expert elicitation, probabilistic fracture mechanics approach should be further developed for addressing such issues.

3. The available literature shows that MIL 217 and other standards are becoming obsolete and not sufficient; this led to development of a new physics-of-failure approach. Many advanced laboratories worldwide are working for this approach for component reliability prediction. The role of physics-of-failure methods - the theme of this conference for predicting reliability of electronic components, was highlighted.

4. R & D is required not only in electronic components but also for mechanical and electrical components. Trends are emerging in this direction in many research laboratories.

5. The area of human reliability analysis and common cause failure needs further attention as the data and models available are limited for the assessment of human performance specially for accident conditions. Use of simulator for studying different aspects of human performances under various conditions to evaluate human errors and preparation of a data base.

6. Regulatory framework which include Quality Assurance Plan for PSA, PSA guide and regulatory policy on PSA, like technical specifications related to system reliability goals, core damage frequency, Large Early Release Frequency, should be available to make PSA input in support of regulatory and operational decision making. This aspect needs further development work to realise the objective.

7. At national level as well as international level this conference provided opportunity for exchange of ideas and expertise in the areas of reliability and safety. It was decided to continue these efforts by conducting workshops, theme meetings, etc. focusing in these areas.

Based on the proceedings of the conference, a book entitled 'Reliability, Safety and Hazard-2010 - Risk- based Technologies and Physics-of-Failure Methods' was published by IEEE and the same was distributed to the participants.

The conference was organised under the part funding programme of Board of research in Nuclear Sciences (BRNS). The organisers and other institutions which provided the financial support include BARC, CALCE-University of Maryland, IEEE Reliability Society, Society for Reliability and Safety, Reltech Consulting Pvt. Ltd., ECIL, AERB, DRDO, BRIT and NPCIL.

SRESA - Life time Achievement Award

On the concluding day of ICRESH-2010, life time achievement awards from Society for Reliability and Safety were conferred to the eminent personalities for their contribution in the field of reliability and safety. This is the first and highest award of its kind in India in the area of reliability and safety. The awards were conferred by Prof. Achintya Haldar, Professor, Civil Engineering & Engineering Mechanics and da Vinci fellow, University of Arizona, USA. The awards were conferred to Dr. Anil Kakodkar, Homi Bhabha Chair and Ex. Chairman AEC for mentoring and pioneering work in the area of safety & reliability; Shri S. S. Bajaj, Chairman, AERB for his significant contribution in the area of nuclear reactor safety; Prof. Michael Pecht, Director CALCE, University of Maryland, USA for significant contribution in reliability, prognostics & health management of electronic components; Prof. Jezdimir Knezevic, Founder MIRCE Academy, UK for significant contribution in the area of mechanical systems reliability and Prof. P. K. Kapur, Head, Operations Research Dept., University of Delhi, for research contributions in the area of software reliability.

Prof. Michael Pecht accepting SRESA life time achievement award for his contribution in the field of physics-of-failure methods for reliability prediction of electronic components

Dr. Anil Kakodkar accepting SRESA life time achievement award for mentoring and pioneering work in the area of reliability and safety

Prof. Jezdimir Knezevic accepting SRESA life time achievement award for his contributio in the area of mechanical systems reliability

Mr. S. S. Bajaj accepting SRESA life time achievement award for his contribution in the area of nuclear safety

Prof. Kapur of Delhi University, accepting SRESA life time achievement award for his contribution in the area of software reliability

PSA activities in NPCIL

G. Srinivas & Ms. Rajee Guptan NPCIL, Mumbai

NPCIL initiated Reliability Studies of Safety systems way back in 1980's with the Narora Atomic Power Plant Design. These studies were performed manually with reliability block diagrams. These studies nevertheless formed the basis of a number of design decisions on redundancy and diversity. Subsequently, reliability assessments of selected systems were performed periodically by all the operating power stations as a part of the Application for Renewal of Authorization (ARA).

In the late nineties with the acquisition of the commercial state of the art PSA Software- Risk Spectrum and the formation of a dedicated group for PSA studies, the first detailed PSA studies for Internal Events was taken up for Kakrapara Atomic Power Station (KAPS) a 220 MWe PHWR and Tarapur Atomic Power Station (TAPS) a 160 MWe BWR. These were the first studies conducted using the large fault tree and small event tree methodology. The fault trees were constructed using immediate cause concept, including the control logics upto the sensor level. The support systems were connected to the main systems. The common cause failure modeling used the alpha factor model to include the sub-group combinations. Some common cause groups used the beta factor model also. Latent and dynamic human errors were modeled using the Technique for Human Reliability Prediction (THERP) tables and the Human Cognitive Reliability (HCR) methods respectively. Component failure data was used with Bayesian updating methodology, while initiating event data for transients was compiled using the Plant experience. These studies were completed in 2002.

Subsequently the Tarapur Atomic Power Project (first Indian 540MWe PHWR) PSA was performed as the first project stage study. This study used the combined PHWR's plant experience for quantifying the transient initiators frequencies. This study attempted to standardize the selection of generic priors for the component failure data from the various international generic sources. Dynamic human error probability was modeled in the event trees, while the latent human error probabilities were modeled in the fault trees. This study was completed in 2005. This study was reviewed by AERB and some PSA applications for Risk Informed Decision making have been performed using this study.

The Level-2 PSA of KAPS was completed in 2005. This study had been performed using postulated estimates of the Source terms using expert judgment. Detailed containment event trees, containment system fault trees, binning of Core Damage sequences into Release Categories were performed to calculate the Large Early Release frequency.

Concurrently (2000-2010) all operating stations were equipped with the Risk Spectrum Software and were also imparted training on its use for PSA Studies. The Technical Services Section at all operating stations acted as the nodal agency for PSA related work. Through constant guidance and in-stage review of the fault tree and event tree modeling and analysis work by the PSA group at NPCIL Headquarters, all the operating stations completed their plant specific Level -1 PSA's for Internal Events. The living PSA's (i.e. Plant Specific PSA's updated to the current plant configurations and incorporating component failure data and plant transient frequencies into the Base case Level-1 PSA) of the Operating Stations are now being performed by the Stations. Periodically the stations also submit to AERB, the Plant Specific reliability analysis of selected safety and safety support systems as a part of the Application for Renewal of Authorization. These studies incorporate the plant specific component failure data for the review period (5 years) as well as the collated data since commercial operation. This presentation of the Reliability studies is based on the Procedure for Reliability studies by Operating Stations for ARA, prepared by PSA group at HQ.

A review of the IAEA 50-P-4 guidelines with the ASME PRA Standard 2005 was conducted and the some modifications have been instituted in the Level-1 PSA studies being performed after 2008. Station performed Level-1 PSA's are now reviewed thoroughly concurrently while it is being performed by an Independent Quality Assurance task force constituted of members from various groups of the Station itself. A procedure for this process has been prepared by PSA group at HQ. The completed Level-1PSA study is then Peer Reviewed by a Peer Review team constituted of PSA experts drawn from other Operating stations and HQ PSA personnel. This peer review follows in letter and spirit the content of Section 6 of ASME PRA Standard 2005.

Shutdown PSA for KAPS has been completed in 2009 by the PSA HQ group. However this study was performed on the base case study of KAPS Level -1 PSA study completed in 2002. Since the revision of KAPS Level-1 PSA study of has been completed in 2010, the Shutdown study using the revised conditional core damage probabilities is being performed.

Seismic PSA for KAPS is being performed. A complete seismic PSA study requires the modification of the Level-1 PSA study to include the seismic failures of the components modeled in the fault trees inclusive of the conditional failure probability or fragility of the components to be integrated with the site specific hazard curve and seismic event trees. The study has been completed using a generic hazard curve. The work on the site specific hazard curve is in progress.

The Fire PSA study of KAPS is being performed. The study is being performed following the procedure of NUREG/CR-6850 (2005).

The Internal and External Flood PSA of KAPS is being performed using the Draft EPRI guidelines for Internal Flood PSA and NUREG/CR-2300 for the external flood respectively.

Simulator studies to generate qualitative and quantitative crew response data to simulated plant transients are being performed at the NPCIL Simulators. These studies are being undertaken to verify and validate the time related Human Cognitive Reliability Model for dynamic Human error probability evaluation by NPCIL in Level-1 PSA studies. The qualitative and quantitative data collection from the simulator studies is being performed in line with the Operator Reliability Experiments (ORE) using Plant simulators (EPRI-NP-6937, 1990).

Component failure data collection has been standardized and all operating stations have been using the standard formats for reporting the failure data. This standardization was instituted using the guidance in NUREG/CR-6823 Handbook of Parameter Estimation for Probabilistic Risk Assessment. The data is being collated at Headquarters and periodic assessment of the data is being performed.

The data collected for Circuit Breakers and Electrical Motor Operated Valves from all the stations has been studied for ascertaining the Uncertainty parameters for the failure rate estimated using the open access software package called BUGS (1995), Bayesian inference Using Gibbs Sampling. The Windows version is called WinBUGS. The use of the Hierarchical Bayes method (with WinBUGS software) has indicated that the failure rates for the EMV's and CB's follows the Gamma distribution for the uncertainty parameters.

Reliability Centered Maintenance (RCM) is being implemented in a phased manner for safety significant equipment at the NPCIL Stations. The RCM process has been initiated with the review of detailed FMEA and FMECA for the target equipment with reference to the Original Equipment Manufacturer's checklists as well as the Standard checklists of Nuclear Maintenance Application Center (NMAC), USA. This helped in identifying the key parameters to be monitored in the Condition Based Monitoring program which in turn is guiding the RCM program.

Mr. G.Srinivas is a Mechanical Engineer from IIT Roorkee (1987). He completed his M.Tech in Energy Systems Engieering from IIT Bombay (1990). He is now pursuing a PhD in Reliability Engineering at IIT Bombay as an external student. He has been with NPCIL since 1990. He is currently working as Additional Chief Engineer and has 13 years experience in the field of Probabilistic Safety Assessments of Nuclear Power Plants. Earlier, he had about 8 years experience in the field of Seismic qualification of Equipment by Analysis.

Ms. Rajee Guptan is an Electrical Engineer from Govt Engg College, Jabalpur (1984). She is from the 28th batch of BARC Training School. She has been with NPCIL since 1985. She is currently in the grade of SO/H and has 14 years experience in the field of Probabilistic Safety Assessments of Nuclear Power Plants. She is currently heading the PSA Section and is responsible for complete PSA related activities of NPCIL for the past 12 years.Prior to PSA activities she was associated with Control and Instrumentation design of Primary Heat Transport System and Moderator System.

NRT-4 Conference Information

Today, advanced reactors are being designed and developed to enhance reactor safety significantly. This is achieved by, among others, relying more on Passive Operating/safety features, better understanding of structural, process and radiation safety. Experiments are also contributing in a significant manner in establishing concepts and in selecting materials that go with the advanced design.

At present PHWRs are the backbone of the Indian Nuclear Power Program along with development of Fast Reactors. AHWR has been planned for demonstration of Thorium utilization, advanced and passive safety features. Other Light Water Reactors with advanced safety features too are now being inducted into the Indian Nuclear Power programme.

The first NRT conference was organised in 2002 with a theme of "Nuclear Reactor Safety". This was followed by "National Conference on Ageing" and National Conference on "Operating Experience of Nuclear Reactors" under Nuclear Reactor Technology conference series. The 2002 conference discussed the ongoing R&D in safety of power reactors, safety improvements by retrofitting/refurbishing of PHWR and research reactors, and key issues in safety evaluation. Since then substantial advances have taken place and issues are identified in the field of safety research and its application to reactor technology, Reactor Safety Division, Bhabha Atomic Research Center, Mumbai organized the 4th National Conference on Nuclear Reactor Technology (NRT-4) during the period of 4-6th March 2011, with the conference theme of "Emerging Trends in Nuclear Safety" under the auspices of DAE-BRNS.

The conference was inaugurated by Dr. S. Banerjee, Chairman, AEC. The conference was orgnised with Plenary Lectures, keynote lectures and invited lectures along with oral presentation of the contributory papers were planned to cover the entire "domain of safety" through expert deliberations. The contributory papers received in structural safety, thermal-hydraulic safety, radiation safety, PSA and regulatory safety were 28 nos., 89 nos., 25 nos., 11 nos. and 2 nos. respectively. Authors of all the contributory papers made their oral presentations.

The papers on structural safety focused primarily on Break Preclusion and LBB Criteria for the current generation Indian reactors and western reactors, seismic

design and performance of RC structures on new seismic design rules, seismic design standardisation, trends in containment design, assessment of reactor channels and fuel bundles under severe accident loads and design qualification of reactors internals and material mechanical property assessment

The papers on thermal-hydraulics addressed the evolving thermal-hydraulic design for 700 MWe PHWR, AHWR, SCWR, CHTR and LMFBRs; employing CFD and neutronics-thermal hydraulic coupling techniques, safety analysis with "uncertainty analysis" to estimate a realistic safety margin, accident management beyond Emergency Operating Procedures (EOPs), best estimate model based source term estimation, tsunami hazard assessment of India coastal NPPs, flow-accelerated corrosion and experimental activities to establish safety and design of these new reactors.

The papers on PSA discussed the frequency-based graded dose criteria, reliability assessment of control logics system for PFBR, application of reliability on structures new reactors like AHWR and ageing study related advancement for instrumentation and system.

The papers on radiation safety covered mainly the dose apportionment criteria environmental discharge limits, improvements made on radiation monitoring systems and radiological issues for spent fuel of PHWR. Evolved techniques of "in-house resins" for different nuclear waste treatment to target zero discharge criteria is also discussed.

Upcoming Events:

1. Nordic PSA Conference - Castle Meeting 2011; Sep 5-6, 2011

The Nordic PSA conference Castle meeting will take place in Sweden on 5-6 September 2011. The conference is held every 18 months as a recurring part of the Nordic PSA group activities and will be arranged by Sandpower AB.
The conference will be held in Stockholm area (location to be given in the call for papers) within easy reach of Stockholm Arlanda Air port.

Important dates

22 April	Invitation and call for papers will be sent out
31 May	Abstract deadline
30 June	Notification to Authors
20 August	Paper Submission Deadline
5-6 September	Castle meeting

For more information contact - mkn@scandpower.com

2. ICRSSE-2011: "International Conference on Reliability, Safety and Security Engineering"; September 28-30, 2011; Singapore; http://app.www.sg/

The International Conference on Reliability, Safety and Security Engineering aims to bring together academic scientists, leading engineers, industry researchers and scholar students to exchange and share their experiences and research results about all aspects of Reliability, Safety and Security Engineering, and discuss the practical challenges encountered and the solutions adopted.

Important dates

30 April	Paper Submission
31 May	Notification of acceptance
30 June	Final paper submission & registration
28-30 Sep	Conference

3. ICRSS 2011: International Conference on Reliability and Structural Safet; Phuket, Thailand; Dec 21-23, 2011

http://www.waset.org/conferences/2011/phuket/icrss/

Important dates

30 August	Paper Submission
30 Sep	Notification of acceptance
31 Oct	Final paper submission & registration
21-23 Dec	Conference

4. 3rd iNTeg Risk Conference: New Technologies & Emerging Risks; June 7-8, 2011; Haus der Wirtschaft Willi-Bleicher Str. 19, 70174, Stuttgart, Germany

Pre-Conference workshop on June 06, 2011
For further details follow the link: www.integrisk.eu-vri.eu

5. International Conference on Progress in Nuclear Energy and Education 20-22 March 2012, London, UK

Deadline for abstract submission - Oct 14, 2011
For further details visit :
http://mail.elsevier-alerts.com/go.asp?/bEC0001/q6LRJ92F/xQ6JJ92F

6. 5th International Conference on Quality, Reliability and Infocom Technology; Oct 19-21, 2011; Kathmandu

Extended Abstract Submission: May 01, 2011-05-05
Notification of Acceptance: June 01, 2011-05-05
Full paper Submission: Aug 19, 2011-05-05
For further details contact:
Prof. N. R. Karki, Dept. of Electrical Engineering, Institute of Engineering, Tribhuvan University, Lalitpur, Nepal. Tel.: +977-1-5543081

7. 21st International Conference on Structural Mechanics in Reactor Technology Nov 6 -11, 2011, India Habitat Centre, New Delhi

Last date for submission of full length paper: June 30, 2011
For further details contact:
SMiRT 21 Secretariat, Reactor Safety Division
Room No. 221, Hall 7, Bhabha Atomic Research Centre
Mumbai 400085, INDIA
Phone : 91-22-25593 778 Fax : 91-22-25505151 Email: bkdutta@barc.gov.in

8. IEEE International Conference on Prognostics and Health Management June 20-23, 2011, Hyatt Regency Denver Tech Center, Denver, Colorado

For further details visit : http://www.phmconf.org/index.htm

9. 99th Session Indian Science Congress Association

Focal Theme: Science & Technology for Inclusive Innovation: Role of Women January 03-07, 2012, Bhubaneshwar

For further details visit : http://www.sciencecongress.nic.in

SRESA Membership drive:

Society for Reliability & Safety (SRESA) has initiated a membership drive for different categories of memberships. The details are provided in the membership application form on last page of this newsletter. Professionals / students working in the field of science and engineering are requested to grab the opportunity to join the society and contribute towards growth of this important field namely reliability and safety. The researchers and professionals are also invited to contribute research articles for the SRESA newsletter. Even though the society is very new the programme it had conducted during the small period and the list of membership shows the growth of the society. Following is a list of society's present members.

S. N.	Name
1	Dr. P. V. Varde, BARC
2	Mr. D. Mathur, BARC
3	Mr. N. S. Joshi, BARC
4	Mrs. S. V. Shrikhande, BARC
5	Dr. V. V. S. Sanyasi Rao, BARC
6	Dr. Manoj Kumar, BARC
7	Mr. R. Bharathan, BARC
8	Mr. P. K. Ramteke, BARC
9	Mr. M. Hari Prasad, BARC
10	Mr. A. K. Ahirwar, BARC
11	Mr. Ram Pratap, BARC
12	Mr. Mayank Agarwal, BARC

S. N.	Name
13	Dr.(Mrs.) Gopika Vinod, BARC
14	Mrs. Janaki Devi, M/s. RelTech
15	Mr. S. K. De, BARC
16	Mr. R. K. Saraf, Ex. BARC
17	Mr. Santhosh, BARC
18	Mr. A. K. Kundu, BARC
19	Prof. P. K. Kapur, Delhi University
20	Dr. S. K. Gupta, AERB
21	Mr. R. B. Solanki, AERB
22	Mr. Rishi Pal Yadav, RRCAT
23	Mr. P. Mukherjee, BARC
24	Mr. Samiran Sen Gupta, BARC

S. N.	Name
25	Mr. R. C. Sharma, BARC
26	Dr. V. N. Achutha Naikan, IITK
27	Mr. Mahendra Prasad, AERB
28	Mr. Sriniwas Golakoti, NPCIL
29	Mr. Tirthankar Gayen
30	Mr. M. Karthikeyan
31	Mr. S. P. Dharne, NPCIL
32	Mr. A. K. Babar, PMS Consultant
33	Dr. D. N. Badodkar, BARC
34	Prof.(Mrs.) A. Srividya, IITB
35	Mr. Amit Shrivastava, BRIT
36	Prof. A. K. Verma, IITB

S. N.	Name
37	Mr. Raut, Ex. BARC
38	Mr. J. R. Rathod
39	Mr. John Arul, IGCAR
40	Mr. Anil Bhatnagar, BARC
41	Mrs. Preeti K. Pal, BARC
42	Mr. M. Elangovan, IGCAR
43	Mr. Tarapada Pyne, ISPAT Steel
44	Mrs. Trupti R. Dani, M/s. RelTech
45	Mrs. A. K. Vijaya, NPCIL
46	Dr. H. N. Suresh, IITB
47	Mr. Aditya Thaduri, IITB
48	Mr. Suraj Rane, Goa University
49.	Mr. D.V.H. Rao, BARC

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Society for Reliability & Safety

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Membership No. ☐
(To be allotted by society office)

Application for Membership of the Society

1.	Name of the Applicant		
2.	Affiliation		
3.	Position held		
4.	Qualification		
5.	Field of Specialization		
6.	Address:		
	Official:	Residential:	
7.	Telephone No. (With STD Code) / Mobile No.		
	Official:	Residential:	
8.	e-mail		
9.	Date of birth (DD/MM/ YY)		
10.	Type of membership applied for (Tick applicable category)	Annual Membership (Yearly Fee Rs.500/-) ☐ Life Member (Fee Rs.2000/-) ☐ Associate Member (Fee Rs.200/-) ☐ Corporate member (Fee Rs.50,000/-) ☐ Affiliate Member (Fee Rs.10,000/-) ☐ Emeritus Member & Patron* (Fee Nil) ☐ (Entry Fee Rs.200/- in addition to above membership Fee)	
11.	Payment Mode		
	Cheque: ☐ Cheque No. : Date:…… Amount:…… Name of the Bank :	Demand Draft: ☐ D D No: Date:…….. Amount:…….. Issuing Bank :……. …… ……	Direct Deposit/Net Banking: ☐ Date:…… Amount:…… Transaction Details:……. ……

Society Account Details: Money to be transferred in favour of 'Society for Reliability and Safety' SBI, BARC, Swift Code : SBININBB508, Account Number 31110442604

** Honorary Position given by Executive Committee's recommendation*

SIGNATURE OF APPLICANT:

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If undelivered please return to
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