Country Report

INDONESIA

FNCA Workshop on Human Resources Development

22 ~ 25 June 2009

Fukui, Japan

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Center for Education and training
National Nuclear Energy Agency (BATAN)

Introduction

Research and Development on nuclear energy shall be conducted in order to master nuclear science and technology for the purpose of safety, security, peace and the welfare of the people

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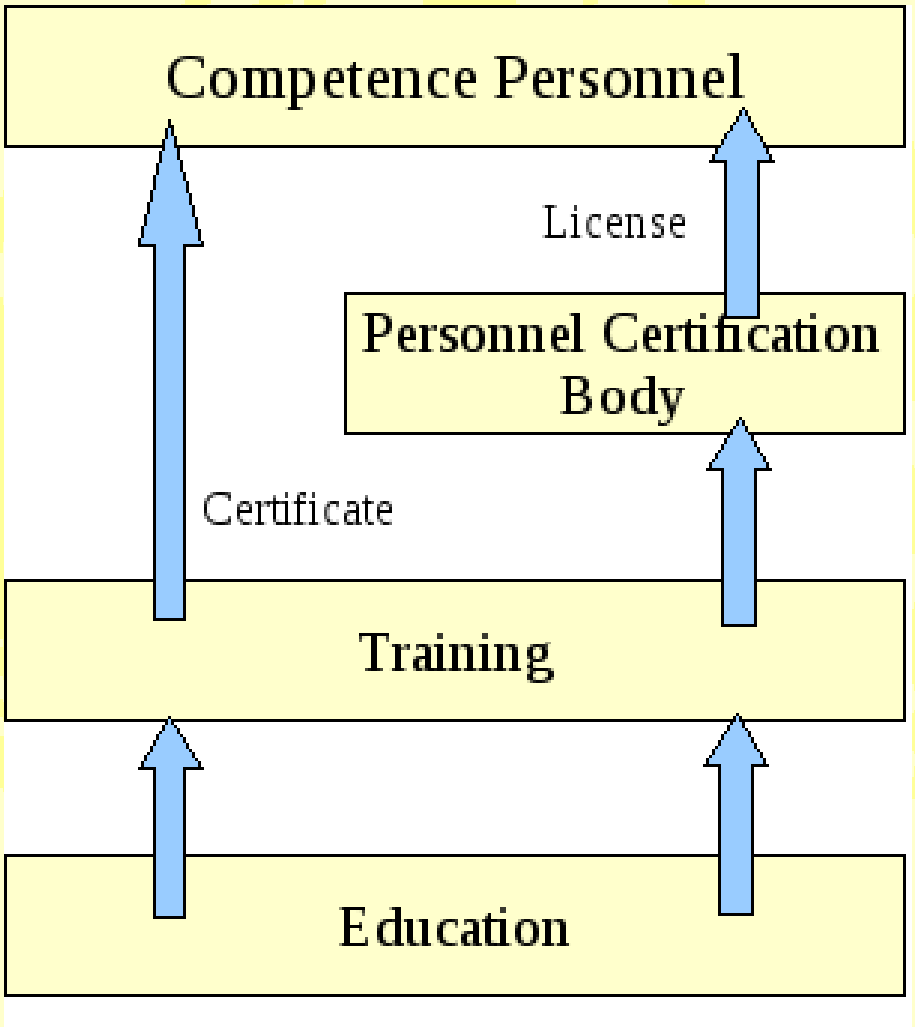
every personnel who works in nuclear research, development, and application should be provided adequate training in a certain level of competence

Strategy and Implementation of HRD



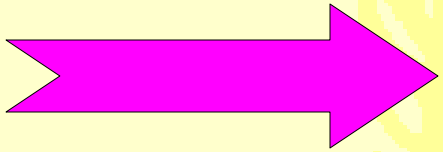
Strategy and Implementation of HRD

Types of training program:

- Pre-service
- Structural
- Functional
- **Technical**

Strategy and Implementation of HRD

Technical Training Scheme



Basic (< 3 years)	Junior (3 ~ 8 years)	Senior (> 8 years)
Radiation Protection for New Employee		
Radiation Measurement and Spectroscopy		
Basic Professional Training Course on Nuclear Safety (level I and II)	Radiation Protection Officer	Radiation Protection Supervisor
	Reactor Operator	Reactor Supervisor
	Reactor Maintenance Officer	Reactor Maintenance Supervisor
	Nuclear Material Inventory Officer	Nuclear Material InventorySupervisor
	Nuclear Fuel Fabrication Officer	
	Nuclear Waste Management Officer	
	Nuclear Emergency preparedness	
	Other technical Training Courses	
Application of Nuclear Technique in Industry and Environment	Radiation Protection Officer	Radiation Protection Supervisor
	Operator Radiography	Supervisor Radiography
	Irradiator/Accelerator Operator	
	Irradiator/Accelerator Maintenance Officer	
	Radiological Emergency preparedness	
	Radioisotope Production Officer	
	Other technical Training Courses	
Other technical Training Courses (Administrative, Quality Assurance, Informatics, instrumentation, etc.)		

Strategy and Implementation of HRD

License (nuclear installation)

- Radiation Protection Officer for nuclear installation.
- Research Reactor Operation as operator and supervisor
- Research Reactor Maintenance as technician and supervisor
- Inventory of Nuclear Material as recorder and supervisor
- Nuclear Installation non Reactor Officer.

Strategy and Implementation of HRD

License (industry and medic)

- Radiation Protection Officer that can be categorized as industrial and medical applications that each category has three level according to its radiological risk
- Radiography Technique that has two level, level I as an operator and level II as a supervisor.
- Irradiator / Accelerator Officer that divided into three fields of work i.e. operation, maintenance, and dosimetry

Strategy and Implementation of HRD

Formal Nuclear Education:

- University of Gajah Mada – Yogyakarta
- University of Indonesia – Jakarta
- Bandung Institute of Technology – Bandung
- University of Padjadjaran – Bandung
- Polytechnic Institutes of Nuclear Technology – Yogyakarta (belong to BATAN)

Priority Area of HRD and On-going Program

Focusing Fields of Nuclear Application:

- Food
- Health
- Energy
- Environment
- ICT
- Industry and manufacture

Priority Area of HRD and On-going Program

Facing Aging Problem:

- very big gap of competency between the senior and junior
- missing competencies are technical experiences
- peak of age distribution in the region of 50 year

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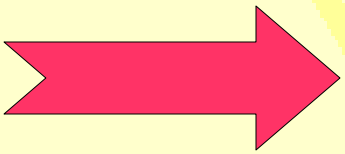


- Sustainability of qualified nuclear scientists and engineers
- Nuclear knowledge preservation and management

Priority Area of HRD and On-going Program

On-going Program

- Training implementation: 22 regular, 12 coaching, and 18 for public
- Standardization of training modules: radiation protection officer, reactor operation and maintenance, inventory of nuclear material.
- Study in domestic university: master and doctorate degree
- Fellowships: training, joint research, and study abroad

Roles of International Cooperation

Developing the human resources through

- Training course / on the job training
- Experts mission
- Scientist / researcher exchange program
- Information exchange
- Developing “off-line” e-learning modules

Progress and Implementation Plan of ANTEP

- FNCA HRD Database
- ANTEP questionnaires on HRD needs and programs

Summary of Training Needs 2009
(Indonesia)

No.	Field	Title	Objectives	Type of Training	Number of Person/year	Duration (months)	Category
1	B-2	Attenuation of plasmodium with irradiation for malaria vaccine preparation	This program is aimed to provide and develop the comprehensive knowledge and skill to the researchers, so that they will able to conduct sporozoite rearing process as malaria vaccine material	Lecture, OJT and experiment	2	2 months	Short to medium Term
2	B-2	Detection of single nucleotide polymorphism (SNP) as radiosensitivity biomarker of cervical cancer	This program is aimed to provide and develop the comprehensive knowledge and skill to the researchers, so that they will be able to conduct a research on the utilization of SNP as radiosensitivity biomarker of cancer cell in improving radiotheraphy outcomes	Lecture, OJT and experiment, MS Degree	1	2 years	Short Term
3	B-2	Genetical characterization of irradiated plasmodium for malaria vaccine development	Genetic characterization of irradiated plasmodium and molecular response in host post immunized with irradiated vaccine materials. This program is aimed to provide the comprehensive knowledge and skill to the researcher, so that they will be able to conduct genetic characterization of malaria vaccine material	Lecture, OJT and experiment	2	4 months	Short Term
4	B-7	Neutron radiography technique and its applications	To give the participants a perspective on the use of neutron radiography technique as for non-destructive tests of industrial material	Expert services	15	2 months	Long Term
5	B-7	Small-angle neutron scattering (SANS) for biomacromolecule structure studies	This program is aimed to provide and develop the comprehensive knowledge and skill to the researchers who is working in crystallography from biomacromolecules. So that they will be able to conduct in doing the experiment, data reduction and data analysis from small-angle scattering data from biomacromolecule.	OJT, experiment and computer-code	2	3 months	Long Term
6	B-9	Implementation of NAA method for geochemical study	This program is aimed to provide the human resources who have a capability and skill in the utilization NAA for geochemical study. Geochemical information on a regional scale is an extremely useful basic product of geological and environmental institutions; it directs the attention of society and investors to the mineral and environmental potential of a land area, as well as possible limitations to developing this point by coordinating with the geological an environmental authorities, the researchers or engineers can continue program of geological mapping.	Lecture and experiment	2	3 months	Medium to long term
7	B-9	BATAN's neutron scattering facilities: improvement and application for fuel cell and hydrogen-storage materials research	This program is aimed to develop and improve the performance of the neutron instruments for a real world-class research and then to enhance the comprehensive knowledge and skill the instrument scientists and researchers who are working in the neutron scattering subject for characterization of materials. Therefore, they will be able to conduct the experiment, data reduction and data analysis.	Expert services, OJT, experiment	2	8 weeks	Medium to long term
8	C-4	Metallography analysis	This program is aimed to provide the comprehensive knowledge and skill to engineer and technicians, so they will able to metallography and alpha beta auto-radiography analysis and evaluation	OJT and experiment	2	6 months	Long Term
9	C-4	Operator Hot cell	This program is aimed to provide the comprehensive knowledge and skill to engineer and technicians, so they will able to conduct maintenance and decontamination process of hot laboratory comply with international safety standards.	OJT	2	6 months	Medium to long term
10	D-2	Development in coating technology for nuclear fuel element and structure material	Research for development in nuclear fuel material in order to increase the properties of material for high burn up such as coating ZrB2 UO2 fuel pellet.	Lecture, OJT and experiment	1	4 months	Short Term

Summary of Training Needs 2009
(Indonesia)

No.	Field	Title	Objectives	Type of Training	Number of Person/year	Duration (months)	Category
11	D-2	Uranium conversion from rejected UO2+additive sintered pellet from nuclear fuel fabrication process via sol-gel route	Training in producing UO2 powder from rejected sintered pellet via sol-gel process	Lecture, OJT and experiment	2	4 months	Long Term
12	D-2	Development in Material for Nuclear Fuel Structure	To enhance the capability and knowledge of participants in producing material base on Zircon alloy for structure material by melting method, characterization and sample preparation and also the analyzing.	Lecture, OJT and experiment	2	3 months	Long Term
13	D2	Modeling for nuclear fuel element	This program is aim to provide knowledge and skill required to engineer and scientist, so they will able to analyze performance of nuclear fuel in order to support research on advance and high temperature nuclear fuel.	Lecture, OJT and experiment	1	4 months	Long Term
14	D7	NDT for PIE	This program is aimed to provide the comprehensive knowledge and skill to engineer and technicians, so they will able to conduct the PIE activities.	OJT and experiment	1	6 months	Long Term
15	D-7	Uranium pick up method from laboratory waste	Research for development reducing uranium concentration from laboratory waste and membrane production for it	Lecture , OJT and experiment	2	3 months	Short Term
16	E-3	Collection, provision and management of nuclear information	The experience gained during the training would enhance the skill in surveying and collecting nuclear information sources using the internet. Accordingly, nuclear information (obtained from internet) may be made available more readily. The experience in document and bibliographic data base management would help enhance library work performance at the institution to a better document management system.	Lecture , computer-code exercise	2	3 months	Long Term
17	C-4	State System of Accountancy and Control (SSAC) for Nuclear Material and Fuel	This program is aimed to provided the comprehensive knowledge and sklill to the engineers and technicians so that they will able to conduct the state system of accuntancy and control for nuclear materials and fuel comply with IAEA standard.	Expert services	15	1 months	Short to medium Term
18	C-5/6	Safety Operation and Maintenance of Research Reactor	This program is aimed to provide the comprehensive knowledge and skill to the engineers and technicians, so that they will able to conduct operation, maintenance and reactor safety of the research reactor comply with international safety standards.	Expert services	15	1 month	Short to medium Term
19	C-7	Decommisioning of Research Reactor	This program is aimed to provide the comprehensive knowledge and skill to the engineers and technicians, so that they will able to conduct decommisioning proccess of research reactor comply with international safety standards.	OJT, Computer code and experiment	2	6 months	Short to medium Term
20	A-5	chromosome analysis technique	to provide the comprehensive knowledge and skill to medical professionals, researcher and technicians so they will be able to conduct chromosome analysis after radiological accident.	Lecture and experiment	2	1 month	Medium to long term
21	A-5	medical management of radiological accident	to provide knowledge and sklills in medical management of radiological accidents	Lecture and experiment	2	1 month	Long Term
22	B-2	Development of Therapeutic Rhenium Radiopharmaceuticals	to enhance capacity and capability of the researcher in performing synthesis and characterisation	OJT and experiment, MS degree	1	1 year	Short Term
23	B-5	Cyclotron Operation and Maintenance	to enhance capacity and capability of the operator and engineer in cyclotron operation	OJT and experiment	2	6 months	Short Term

Summary of Training Needs 2009
(Indonesia)

No.	Field	Title	Objectives	Type of Training	Number of Person/year	Duration (months)	Category
24	B-2	Development of PET Radiopharmaceuticals	to enhance capacity and capability of the researcher to perform and development of PET pharmaceuticals	OJT and experiment	2	6 months	Short Term
25	D-7	Industrial preparation for the first npp construction and its technology transfer	The trainees should be contributed to arrange and prepare the policy for national industry participation in the first and the next NPP construction. It is also related to the infrastructure preparedness in NPP construction as mention in the NG-T.3.2. "Evaluation of the status of the national nuclear infrastructure development". In the future, the trainees should responsible for this duties.	OJT, Lecture and experiment	2	3 months	Short Term
26	D-7	Corporate Social Responsibility (CSR) of Nuclear Power Plant	to be able to survey and review of CSR program realization in existing NPP; to be able to apply the realization of CSR program based on specific condition of Indonesia; will be involved in assisting Government to success the introduction of NPP program in Indonesia	OJT, Lecture and experiment	2	2 months	Medium Term
27	D-7	Project Management for NPP Construction	to be able to review existing plan HRD,cost,time,quality,procurement and risk Management for NPP development; to be able to apply of Project Management for NPP Constructions based on specific condition of Indonesia	Lecture and experiment, computer code	2	3 months	Short Term
28	D-6	Plant Design of Nuclear Power	the trainees will be involved in assisting BAPETEN and other institutions in reviewing any proposed NPP, by vendors, and also in developing plant design suitable for Indonesian condition	Lecture and experiment, computer code	2	3 months	Medium Term

Summary of Training Program 2009
(Trainings Offered by Indonesia)

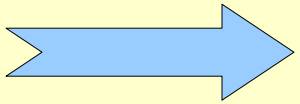
No.	Unit	Title	Objectives	Number of Person/year	Duration (months)	Remark
1	Pusdiklat	Installation and Maintenance of Nuclear Spectroscopy and Its Application	Train the participants to install and maintain the nuclear instruments such as counting and spectroscopy system, which are used for industrial and environmental applications.	2	3	Contribution: - training fee - expendables - instructor
2	Pusdiklat	Microcontroller Application for Refurbishment of Nuclear Instrument in LabVIEW Environment	Train the participants to program and assembly microcontroller as a high integrated component in refurbishment of nuclear instrument and to program a user friendly software using LabVIEW	2	3	Contribution: - training fee - expendables - instructor
3	PRSG	Research Reactor Operation	Trainee will imporove her/his knowledge and skill on radiation protection, radiation equipment and assessing laboratory installation and safety analysis.	2	2	Contribution: - training fee - expendables - instructor
4	PATIR	Ultra-violet curing of surface coating	To train the participants on experimental or practical work of surface coating using ultra-violet (UV) radiation.	2	1	Contribution: - training fee - expendables - instructor
5	PATIR	Studies on analytical detection methods for irradiation treatment of foods	To provide comprehensive knowledge and skill to conduct research and development on the above subjects comply with international safety standards both for the researchers and technicians.It is desirable if such methods must be implemented and done by Indonesian authorities who concern with control of labelling of irradiated food as sanitary and phytosanitary purposes moving in global market.	2	1	Contribution: - training fee - expendables - instructor

Notes:

Pusdiklat: Center for Education and Training – BATAN, Pasar Jumat, Jakarta
PRSG: Center for Multi Purpose Reactor – BATAN, Serpong
PATIR: Center for Application of Isotopes and Radiation – BATAN, Pasar Jumat, Jakarta

HRD Necessary for Introduction of NPP

- Indonesia has been considering to introduce the nuclear power option into its energy mix supply: 2,000 MW to be operated in around 2016.
- Although definite timetable has not yet been determined, the development of a basic infrastructure for preparation of NPP, which is included human resource development, have to be initiated.



National Team of HRD for NPP

HRD Necessary for Introduction of NPP

Documents on human resource development for NPP

- Personnel requirements (qualitative and quantitative)
- Existing infrastructure of human resource developments
- Action plans for preparation of human resources

HRD Necessary for Introduction of NPP

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Nuclear training facility for NPP

- Concept of organizational structure
- Concept of competency based training
- Concept of training facilities included laboratories

HRD Necessary for Introduction of NPP

Other activities

- Under international cooperation: sending engineers and managers abroad
- Expert mission in order to review the preparation
- Intensify the public information and education

Roles of Nuclear Research Institutes

In the area of public information and education:

- providing technical and financial support to nuclear education programs at universities,
- providing assistance on improvement of science textbook for high school student,
- invite university lecturers and high school teachers to attend training course or seminar on nuclear energy applications.

Roles of Nuclear Research Institutes

Preparation of infrastructure :

- feasibility studies, site evaluation, safety and engineering review, environmental aspect, public acceptance etc.
- preparation of education and training for NPP personnel such as development of competency based training and development of curricula and syllaby
- prepare its laboratory, facility and instructors in case that the initial training for NPP personnels have to be organized and conducted by BATAN

Table 2
Long term Vision of HRD National Plans

HRD National Plans - Long-term Vision	By 2020	By 2030
(1) Strategy and implementation of human resource development	- Sustainable development of nuclear science and technology - Develop and implement a competency based training	- Sustainable development of nuclear science and technology - implementation of competency based training
(5) Human resource development necessary for introduction of nuclear power,	- Design the human resource development program for nuclear power plant - Development of basic concept of nuclear training center for nuclear power plant - Development of standard curriculla and sillaby of training for NPP personnel - Implementation of HRD program	- Implementation of HRD program

Needs					**Expected Program**	
No.	priolity				National HRD Program	International HRD Program
By Year 2010						
1		Fields	A. Radiation Safety and Radiological Waste	Title/Details	Training course on Radiation Protection Officer for industrial and medical application	
		Target	Engineer/Postgraduate	Method	Lecture	
		Number (people)	300	Number (people)	300	
		Coment	training courses for public	Period	2 ~ 3 weeks	
2		Fields	B. Radiation and Isotope Application	Title/Details	Training course on Industrial radiography.	
		Target	Engineer/Postgraduate	Method	Lecture	
		Number (people)	150	Number (people)	150	
		Coment	training courses for public	Period	2 ~ 4 weeks	

Table 2
Long term Vision of HRD National Plans

3		Fields	A. Radiation Safety and Radiological Waste	Title/Details	Training courses on radiation and nuclear safety	Reseacher Exchange Program
		Target	Engineer/Postgraduate	Method	Lecture	Research
		Number (people)	200	Number (people)	200	5
		Coment	Training for BATAN's staff	Period	2 ~ 3 weeks	6 months
4		Fields	B. Radiation and Isotope Application	Title/Details	Training courses on radiation and isotope application	Reseacher Exchange Program
		Target	Engineer/Postgraduate	Method	Lecture	Research
		Number (people)	100	Number (people)	100	10
		Coment	Training for BATAN's staff	Period	2 ~ 3 weeks	6 months
5		Fields	C. Research Reactor	Title/Details	Training courses for research reactor personnel	Reseacher Exchange Program
		Target	Operator/Inspector	Method	Lecture	OJT
		Number (people)	100	Number (people)	100	5
		Coment	Training for BATAN's staff	Period	2 ~ 3 weeks	6 months
6		Fields	D. Nuclear Power Reactor	Title/Details	Training course for Instructor of NPP	Reseacher Exchange Program
		Target	Lecturer/Instructor	Method	Lecture	OJT
		Number (people)	20	Number (people)	20	5
		Coment	Training for BATAN's staff	Period	2 ~ 3 weeks	6 months

Table 2
Long term Vision of HRD National Plans

7		Fields	E. Nuclear Administration	Title/Details	Training course on administrative aspect	
		Target	Administrative officer	Method	Lecture	
		Number (people)	150	Number (people)	150	
		Coment	Training for BATAN's staff	Period	1 ~ 2 weeks	

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Long term Vision of HRD National Plans

HRD National Plans - Long-term Vision	By 2020	By 2030
(1) Strategy and implementation of human resource development	- Sustainable development of nuclear science and technology - Develop and implement a competency based training	- Sustainable development of nuclear science and technology - implementation of competency based training
(5) Human resource development necessary for introduction of nuclear power,	- Design the human resource development program for nuclear power plant - Development of basic concept of nuclear training center for nuclear power plant - Development of standard curriculla and sillaby of training for NPP personnel - Implementation of HRD program	- Implementation of HRD program

Needs					Expected Program	
No.	priolity				National HRD Program	International HRD Program
By Year 2020						
1		Fields	A. Radiation Safety and Radiological Waste	Title/Details	Training course on Radiation Protection Officer for industrial and medical application	
		Target	Engineer/Postgraduate	Method	Lecture	
		Number (people)	300 per year	Number (people)	300 per year	
		Coment	training courses for public	Period	2 ~ 3 weeks	
2		Fields	B. Radiation and Isotope Application	Title/Details	Training course on Industrial radiography.	
		Target	Engineer/Postgraduate	Method	Lecture	
		Number (people)	150 per year	Number (people)	150 per year	
		Coment	training courses for public	Period	2 ~ 4 weeks	

Table 2
Long term Vision of HRD National Plans

3		Fields	A. Radiation Safety and Radiological Waste	Title/Details	Training courses on radiation and nuclear safety	Reseacher Exchange Program
		Target	Engineer/Postgraduate	Method	Lecture	Research
		Number (people)	100 per year	Number (people)	100 per year	5 per year
		Coment	Training for BATAN's staff	Period	2 ~ 3 weeks	6 months
4		Fields	B. Radiation and Isotope Application	Title/Details	Training courses on radiation and isotope application	Reseacher Exchange Program
		Target	Engineer/Postgraduate	Method	Lecture	Research
		Number (people)	150 per year	Number (people)	150 per year	15 per year
		Coment	Training for BATAN's staff	Period	2 ~ 3 weeks	6 months
5		Fields	C. Research Reactor	Title/Details	Training courses for research reactor personnel	Reseacher Exchange Program
		Target	Operator/Inspector	Method	Lecture	OJT
		Number (people)	100 per year	Number (people)	100 per year	5 per year
		Coment	Training for BATAN's staff	Period	2 ~ 3 weeks	6 months
6		Fields	D. Nuclear Power Reactor	Title/Details	Training course for Instructor of NPP	Reseacher Exchange Program
		Target	Lecturer/Instructor	Method	Lecture	OJT
		Number (people)	20 per year	Number (people)	20 per year	5 per year
		Coment	Training for BATAN's staff	Period	2 ~ 3 weeks	6 months

Table 2
Long term Vision of HRD National Plans

7		Fields	D. Nuclear Power Reactor	Title/Details	Training course for NPP personnel	
		Target	Operator/Inspector	Method	OJT	
		Number (people)	100 per year	Number (people)	100 per year	
		Coment	training courses for public	Period	1 month	
8		Fields	E. Nuclear Administration	Title/Details	Training course on administrative aspect	
		Target	Administrative officer	Method	Lecture	
		Number (people)	150 per year	Number (people)	150 per year	
		Coment	Training for BATAN's staff	Period	1 ~ 2 weeks	

Table 3
Qualitative Standpoint

(2) Priority area of HRD and on-going national HRD program including activities of national training center (Needs)
- emphasize on sustainability of qualified nuclear scientists and engineers in the R&D of nuclear research and application on food, health, and energy. - preservation and management must be carried out in a proper way - the design of training implementation should be improved to accelerate the transfer of knowledge and skill - In the fiscal year 2009, conducts 22 regular training courses and 12 “coaching – mentoring” for BATAN staffs, and 18 training courses for public
(3) Roles of international cooperation such as FNCA for national HRD program
Developing the human resources, covering high level knowledge in nuclear science and technology, through training course, experts mission, scientist / researcher exchange program, information exchange, and developing “off-line” e-learning module.
(6) Roles of nuclear research institute in HRD necessary for introduction of nuclear power,
- as technical support organization (TSO) in some activities such as feasibility studies, site evaluation, safety and engineering review, environmental aspect, public acceptance etc. - preparation of education and training for NPP personnel such as development of competency based training and development of curricula and syllaby for required training - prepare its laboratory, facility and instructorsfor implementing the training courses for NPP personnels
(7)Improvement of ANTEP in connection with MEXT Nuclear Researcher Exchange Program
the topic of research or training, which is offered and accepted, are correlated with ANTEP questionnaire

Table 3
ANTEP Program in 2009

(4) Progress and implementation plan of ANTEP

No	Fields	Program Title	Organizer (Sponsor)	Specification	Implementation Timing	Type of Training	Duration	Acceptable persons per year	Language	Note/ Required technical background	Allowance, In-kind Contribution	URL
		Indonesia										
1	B	Nuclear Reseacher Exchange Program	MEXT	Development of polymer electrolyte membranes for fuel cells using radiation technique	2008 ~ 2009	Research	12 m	1	English	Researcher	Air Ticket Accommodation Daily Allowance	
2		MEXT Training	MEXT	Operation and maintenance technology in post rradiation examination (PIE) facility	2008	OJT	3 m	1	English	Scientist/Engineer	Air Ticket Accommodation Daily Allowance	
3	A	MEXT Training	MEXT	Radioactive waste management in a nuclear power station	2008	OJT	3 m	1	English	Scientist/Engineer	Air Ticket Accommodation Daily Allowance	
4		MEXT Expert mission	MEXT	Assessment of neutron and thermal-hydraulic aspect of PWR core	2009	expert mission	1 w	1	English		Air Ticket Accommodation Daily Allowance	
5		MEXT Expert mission	MEXT	Residual stress analysis using diffraaction technique	2008	expert mission	2 w	1	English		Air Ticket Accommodation Daily Allowance	
6		Nuclear Reseacher Exchange Program	MEXT	Research and development for graft polymarization onto natural polymers	2009/ 2010	Research	6 m	1	English	Researcher	Air Ticket Accommodation Daily Allowance	
7		Nuclear Reseacher Exchange Program	MEXT	Analysis of protein function using neutron scattering data	2009/ 2010	Research	6 m	1	English	Researcher	Air Ticket Accommodation Daily Allowance	
8												

Fields

- **A Radiation Safety and Radioactive Waste**
- **B Radiation and Isotope Application**
- **C Research Reactor**
- **D Nuclear Power**
- **E Nuclear Administration**

Thank You