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# Overview and Progress of FNCA

Tomoaki WADA  
FNCA Coordinator of Japan  
Vice President,  
The Japan Foundation of Public Communication  
on Science and Technology

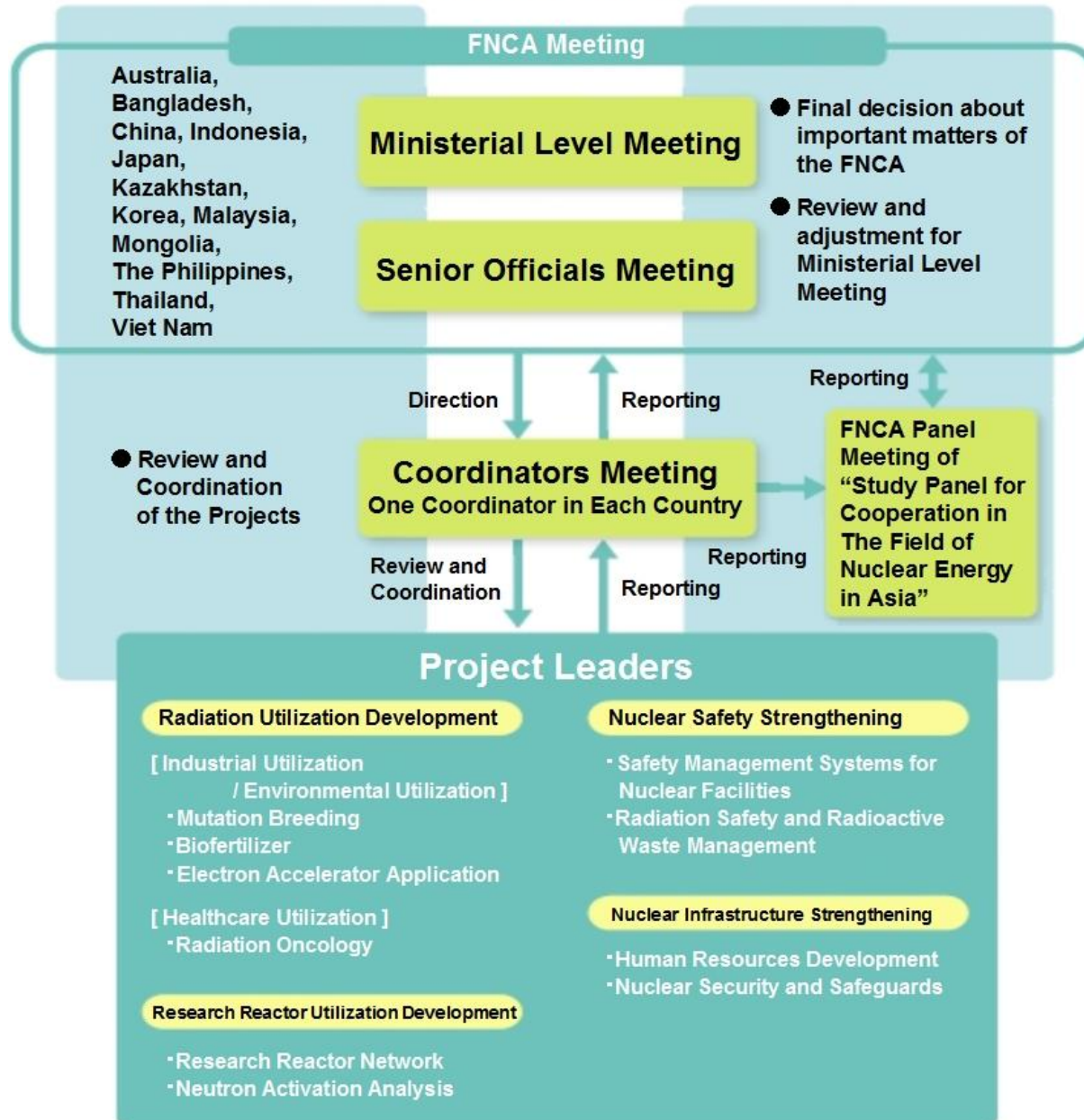
10th International Conference  
Nuclear and Radiation Physics  
Kurchatov

# FNCA

(Forum for Nuclear Cooperation in Asia)

- FNCA, which started in 1990, is a Japan-led cooperation framework for the peaceful use of nuclear technology in Asia.
- This cooperation consists of FNCA meetings and the project activities with the participation of Australia, Bangladesh, China, Indonesia, Kazakhstan, Korea, Malaysia, Mongolia, the Philippines, Thailand and Vietnam.

# The FNCA Framework



# ● R&D Projects on Applications of Radiation and Isotopes

- Research Reactor Utilization
  - (1) Neutron Activation Analysis (NAA)
  - (2) Research Reactor Network (RRN)
- Applications for Sustainable Agriculture
  - (3) Mutation Breeding
  - (4) Bio-fertilizer
- Application for Improving Medical Care
  - (5) Radiation Oncology
- Application for Radiation Processing
  - (6) Electron Accelerator Application

- **Projects for Building Infrastructure**
- **Nuclear Safety Strengthening**
  - (7) Safety Management Systems for Nuclear Facilities
  - (8) Radiation Safety and Radioactive Waste Management
- **Nuclear Infrastructure Strengthening**
  - (9) Human Resources Development for Nuclear Science and Applications
  - (10) Nuclear Security and Safeguards
- **Study Panel for Cooperation in the Field of Nuclear Energy in Asia**

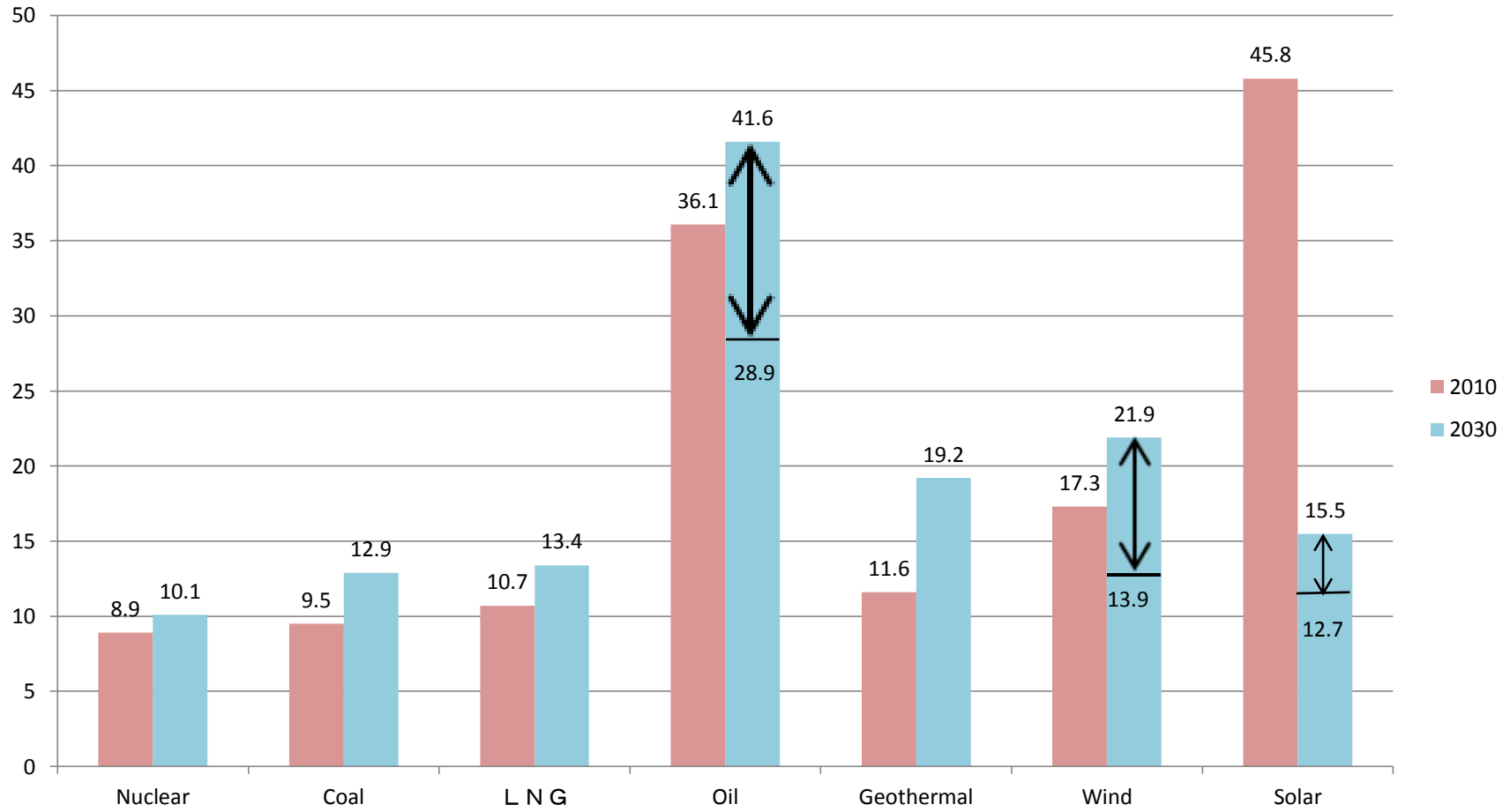
- Nuclear Power Policy in the new *Strategic Energy Plan* of Japan

# Basic Nuclear Power Policy for the new *Strategic Energy Plan* (April, 2014)

- The energy output of nuclear power per amount of fuel is inordinately large and it can continue producing power for several years with only domestic fuel stockpiles. Nuclear power is an important base-load power source. As a low-carbon and quasi-domestic energy source, it contributes to the stability of energy supply-demand structures on the major premise of ensuring safety, because of the following perspectives:
  - 1) superiority in the stability of energy supplies and efficiencies
  - 2) low and stable operational costs
  - 3) free from GHG emissions during operation.

# Estimating the cost of power generation in 2030

(JPYen/Kwh)





# Electric Power Resources in 2030 (Plan)

- Renewable Energy (Solar, Wind, Geothermal)  
22 - 24%
- Nuclear Power 20 - 22%
- LNG 27%
- Coal 26%
- Oil 3%

- Major Successful Results of FNCA Projects

# Project on Mutation Breeding

- 2002-2006 Drought tolerance of Sorghum and Soy beans
- 2003-2009 Insect resistance of Orchids
- 2004-2010 Disease resistance of Bananas
- 2007-2012 Composition or quality of Rice
- 2013~ Mutation breeding of Rice for sustainable agriculture

Using gamma-ray and/or ion beams to develop mutant varieties that are resistant to various environmental stresses, early-maturity, and low-input mutant varieties relevant to the demands of each country.

# Mutation Breeding



**Disease resistant banana in the Philippines**



**Insect resistant orchid in Malaysia**



**New disease resistant rice variety in Vietnam (right):  
5-14% yield increase**

# Project on Electron Accelerator Application

- 2002-2005 Treatment of flue-gas
- 2006-2008 Radiation processing of natural polymers
- 2009~ R&D on plant growth promoter/elicitor and super water absorbent

To develop a plant growth promoter and elicitor by degradation of natural polymers as well as applications of radiation cross-linked hydrogel for super water absorbent, aiming for technical transfer to the end users.

# Oligo-chitosan Effect on Bitter Cucumber Indonesia, BATAN, 2012

The crop yield increases by about 40% by application of Oligochitosan



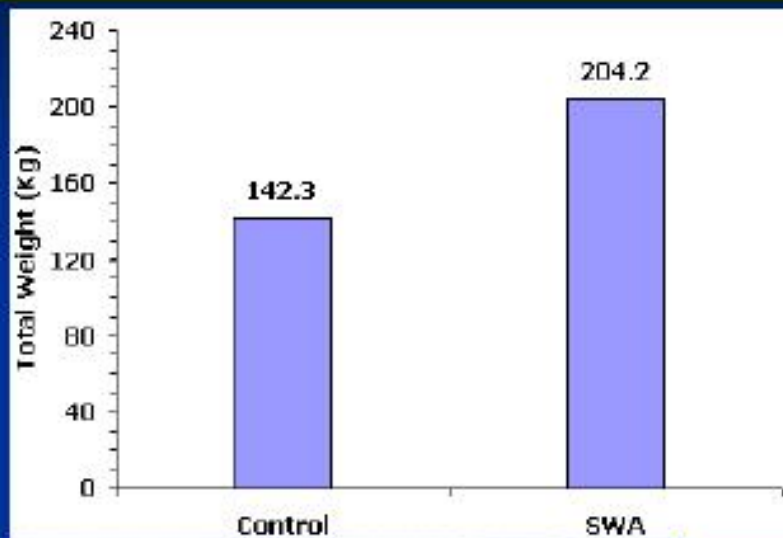
Without Oligochitosan



With Oligochitosan



# Effects of Super Water Absorbent on Baby Corn Thailand, TINT, 2013



**AAc grafted starch by radiation**

**Field test in Kanchanaburi Province**

**-Yield increase: 43.5%-  
Reduced watering.**



**Without SWA**



**With SWA**

# Effects of Oligochitosan and SWA on shallots (Indonesia)



Without Oligo-chitosan and SWA

With Oligo-chitosan and SWA

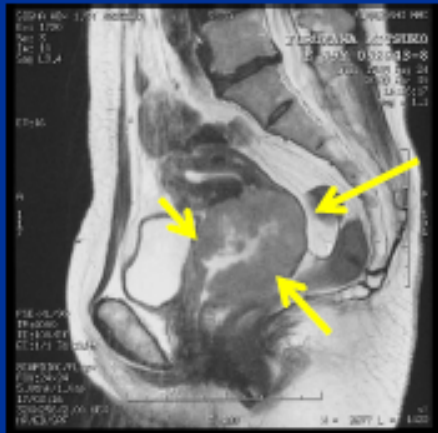


# Project on Radiation Oncology

- 1996~ Radiation Therapy or Chemo-radiotherapy for Cervical Cancer
- 2005~ Chemo-radiotherapy for Nasopharyngeal Cancer
- 2009~ Hypofractionated Radiotherapy for Breast Cancer
  - The aim of this project is to contribute to improving the radiation treatment techniques for cancers that are more prevalent in the Asian region.
  - The protocols for radiation therapy established by this project have been utilized in China, Japan, Korea, Malaysia, Thailand, and Vietnam.
  - The next challenge is the adoption of these protocols in hospitals in member countries.

# Protocol Study for Radiation Therapy of Uterine Cervix Cancer·Head/neck Cancer

Advanced uterine cervix cancer treated by new protocol (CRT) 5-y survival 55% (40% by RT)



Before



After

WS held in China, Jan. 2012

Standard Protocol in Indonesia, Malaysia, Thailand.

Challenge: Dissemination to all hospitals in MCs

# Project on Research Reactor Network

- 2011-2013  
Information exchange on RI production and supply in each country, aimed at building a regional network for the stable supply of medical RI, Mo-99
- 2013~
  - Activities intended to establish a regional network for stable production and supply of medical RI
  - Development of n-gamma technology for Mo-99 production
  - Sharing experience for designing new multipurpose research reactors in member countries
  - International cooperation for sharing multi-purpose research reactors in the region

# Project on Nuclear Activation Analysis

- With neutron activation analysis, multiple elements can be determined with high accuracy for a common and single sample, and even solid samples can be non-destructively analyzed.
- 2002-2004 Introduction of  $k_0$  standardization method in each country, common analysis of SPM (suspended particulate matter)
- 2005-2007 establishment of  $k_0$  standardization method in each country
- 2008-2014 NAA for geochemical samples, food samples, and marine sediments
- 2015~
  - (1) NAA of PM<sub>2.5</sub> for environmental monitoring in Asian region
  - (2) NAA of rare-earth elements for resource exploration in Asian region

# Project on Radiation Safety and Radioactive Waste Management

- 2002-2004 SRSM(Spent Radiation Source Management), TENORM(Technologically Enhanced Naturally Occurring Radioactive Management)
- 2005-2007 Decommissioning and Clearance
- 2008-2013 Radiation Safety and Radioactive Waste Management
- 2014~
  - Nuclear/Radiological Emergency Preparedness and Response,
  - Information Exchange on Radiation Safety and Waste Management

# Project on Radiation Safety and Radioactive Waste Management

## FNCA Consolidated Report on Radiation Safety

March 2014

Radiation Safety and Radioactive  
Waste Management Group,  
Forum for Nuclear Cooperation in  
Asia (FNCA)

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# Project on Nuclear Security and Safeguards

- Because of the rapid increase in nuclear material in the Asian region, nuclear security and nuclear safeguards to promote the peaceful use of nuclear power are set to become more important. This project aims to reinforce awareness of the importance of nuclear security and nuclear safeguards among FNCA countries, and to support human resource and infrastructure development.
- 2011-2013 Discussion on 3S (safety, safeguards, and security), Joint open seminar with APSN
- 2014~ Sharing information on nuclear security and safeguards system in every country, and focusing on activities and good practices for fostering a nuclear security culture,

# Project on Human Resource Development

- 2002~
- The activities of this project aim to promote mutual exchange of HRD knowledge and strengthen the foundation of nuclear technology in Asian countries.
- Main activities are understanding the needs of HRD in the nuclear field, exchanging information and surveying of nuclear HRD, discussions on future HRD cooperation, joint study of training materials, and others.
- Since 2014, this project has focused on cultivating *Nuclear communicators for public acceptance*.



# FNCA Activities and MEXT Training Programs on Nuclear Energy and Radiation Utilization

## Forum for Nuclear Cooperation in Asia (FNCA)

### Nuclear Researchers Training Program

#### 1. FNCA Research Course

This course conforms to the FNCA project themes.

(3~6 months)

#### 2. Individual Research Course

This course meets the ANTEP Needs from Asian Countries. (3~6 months)

#### 3. Basic and Fundamental Course

This course presents various lectures on Nuclear Engineering/Nuclear Safety Engineering. (1~3 months)

NSRA

### Instructors Training Program

#### 1. Instructors Training Course

This course is set up to invite participants, who are expected to be the future instructors in their countries. (6~8 weeks)

#### 2. Follow-up Training Course

Japanese experts visit Asian countries to impart technical advice to local instructors who have participated in Instructors Training Course. (1~2 weeks)

#### 3. Seminars on Nuclear Technologies

- (1) Nuclear Plant Safety
  - (2) Atomic Energy Administration
  - (3) Basic knowledge of Radiation
  - (4) Site Location of Nuclear Facility
- (1~4 weeks)

JAEA

# MEXT Human Resources Development Program

## <Nuclear Researchers Training Program>

	JFY2012	JFY2013	JFY2014
Bangladesh	3	4	2
China	2	1	1
Indonesia	3	4	1
Kazakhstan	1	2	1
Malaysia	2	2	1
Mongolia	2	1	1
The Philippines	1	2	1
Sri Lanka	1	2	2
Thailand	4	2	3
Vietnam	4	3	7
<b>Total</b>	<b>23</b>	<b>23</b>	<b>20</b>

## <Nuclear Instructors Training Program>

	JFY2012	JFY2013	JFY2014
Bangladesh	8	9	8
China	1	0	0
Indonesia	10	9	8
Kazakhstan	6	9	3
Malaysia	10	17	9
Mongolia	8	7	8
The Philippines	5	5	5
Sri Lanka	2	2	3
Thailand	10	10	10
Vietnam	12	21	15
Turkey	-	-	4
<b>Total</b>	<b>72</b>	<b>89</b>	<b>73</b>

THANK YOU  
FOR  
YOUR ATTENTION