



Safeguards R&D at JAEA

for the integrated safeguards, detection of undeclared activities and advanced nuclear fuel cycle

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Chronology of Safeguards in Japan

1976 Ratification of NPT

1977 Full scope Safeguards Agreement entered into force



Establishment of effective safeguards approach
for nuclear fuel cycle facilities

1993 Program 93+2



Strengthened safeguards with Part-1 measures

1999 Additional Protocol entered into force



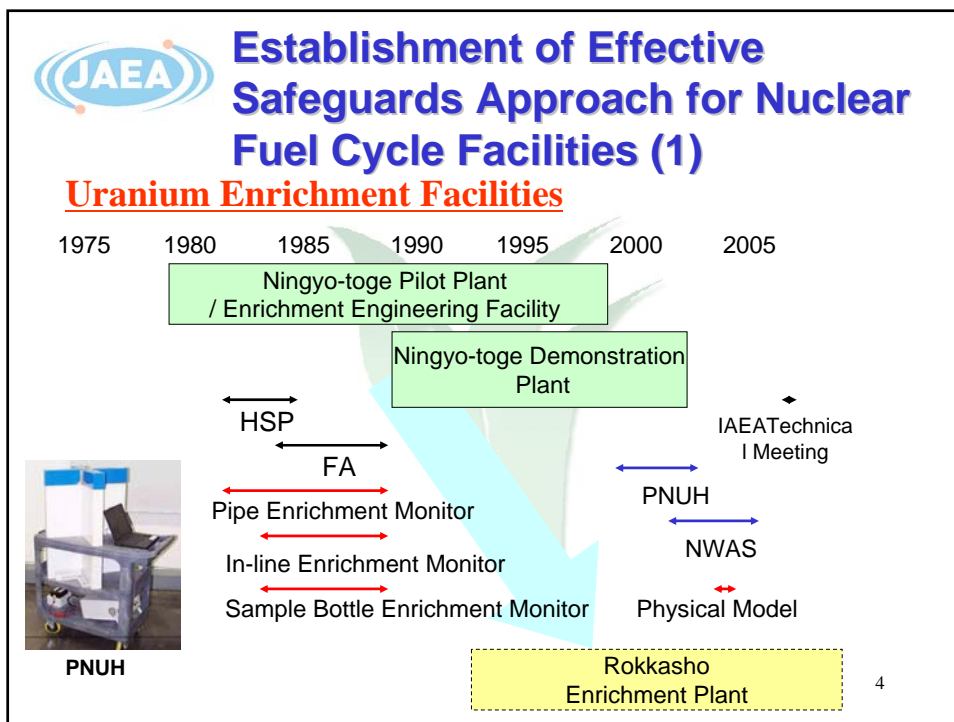
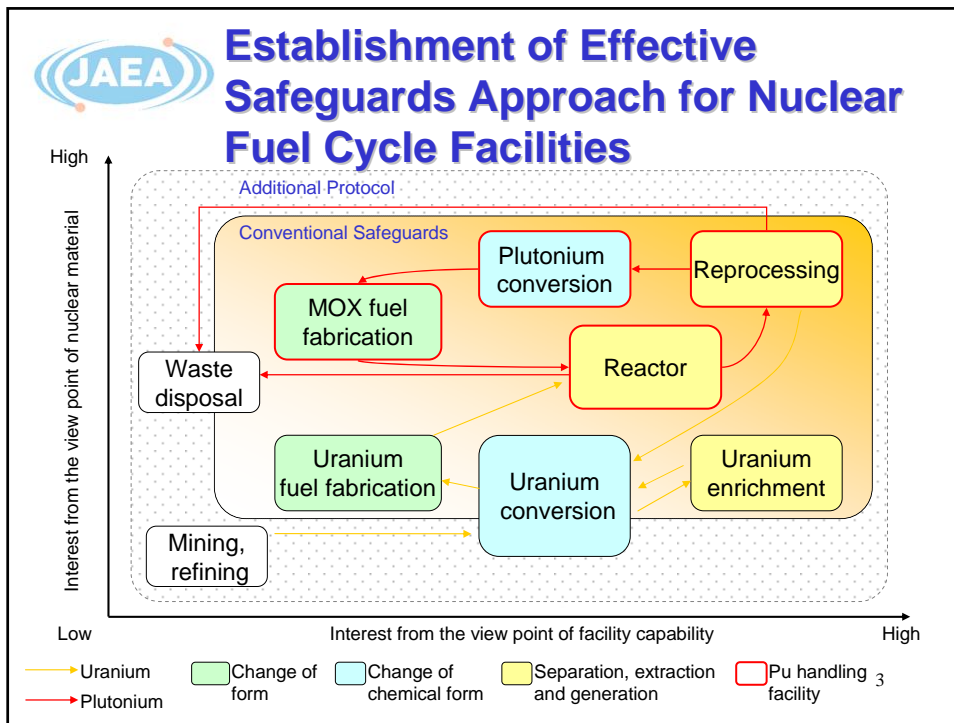
Strengthened safeguards with additional protocol

2004 Broader conclusion



Integrated Safeguards

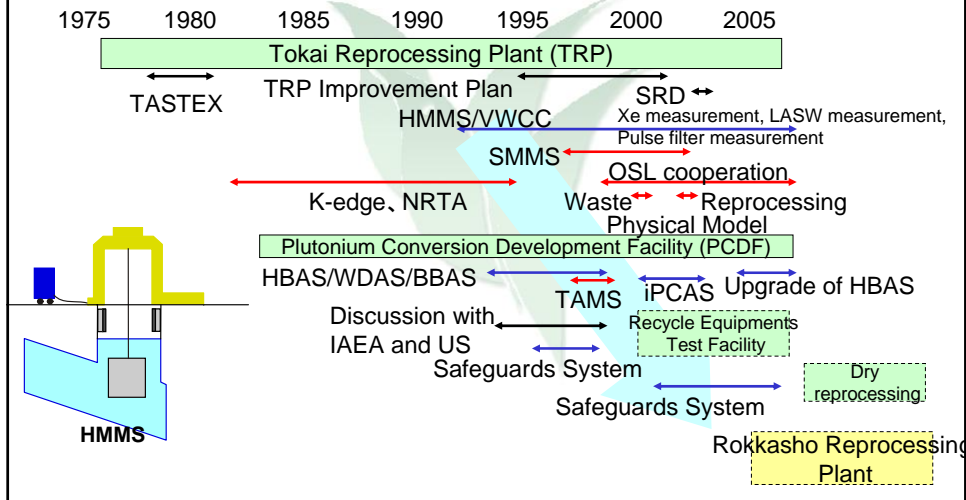
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Establishment of Effective Safeguards Approach for Nuclear Fuel Cycle Facilities (2)

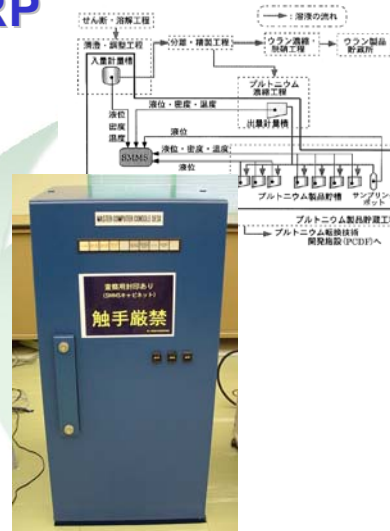
Reprocessing Facilities



Unattended Verification System at TRP



Vitrified Waste Canister Counter



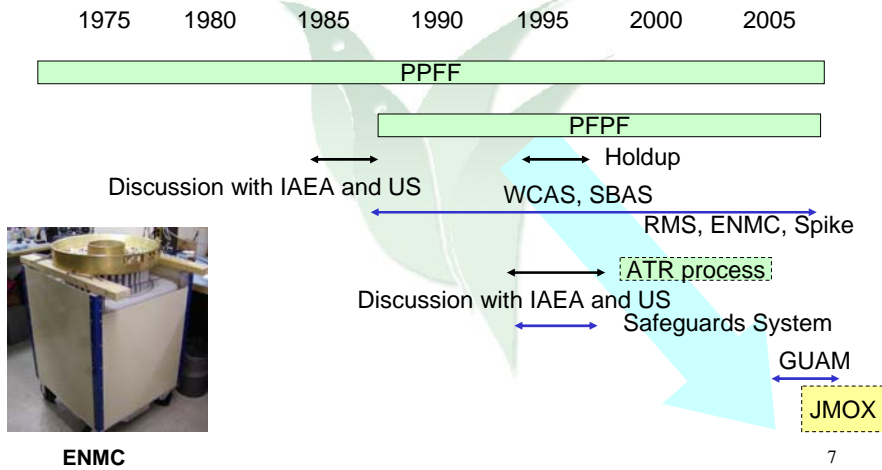
Solution Measurements Monitoring and System

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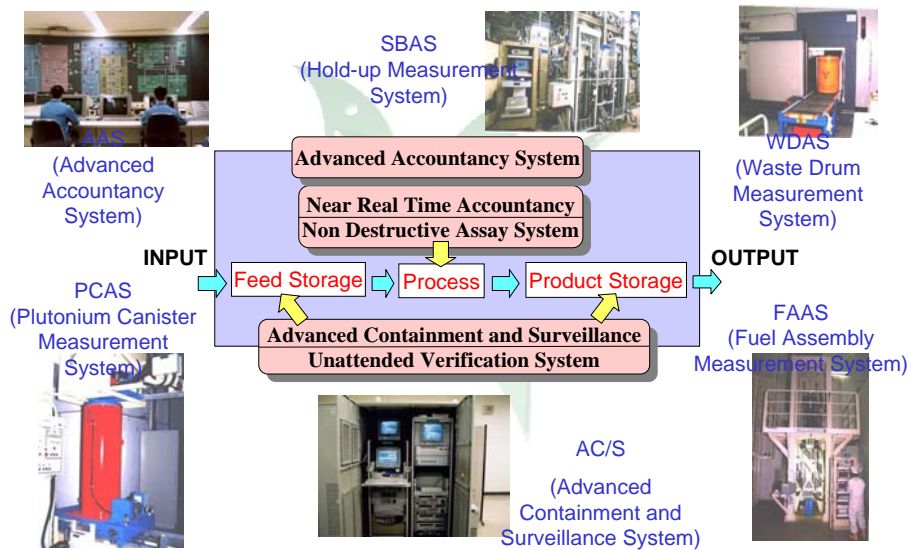


Establishment of Effective Safeguards Approach for Nuclear Fuel Cycle Facilities (3)

MOX Fuel Fabrication Facilities



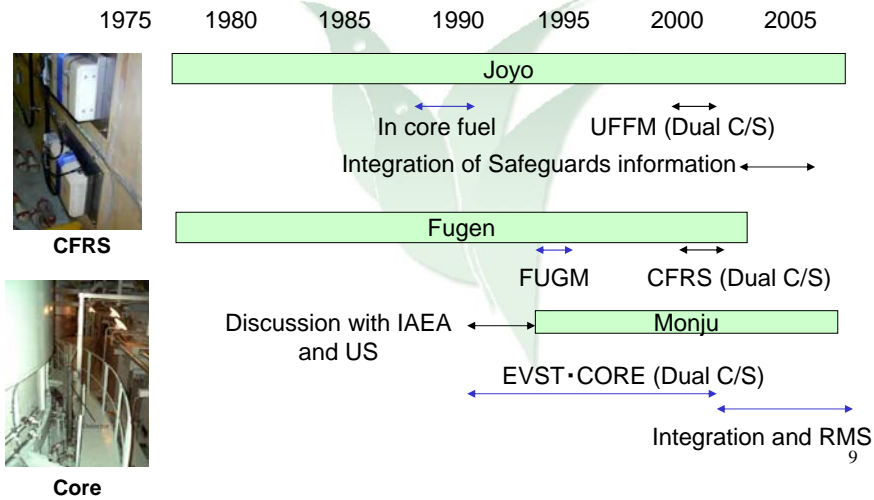
Unattended Verification System and Material Accountancy System at PFPF





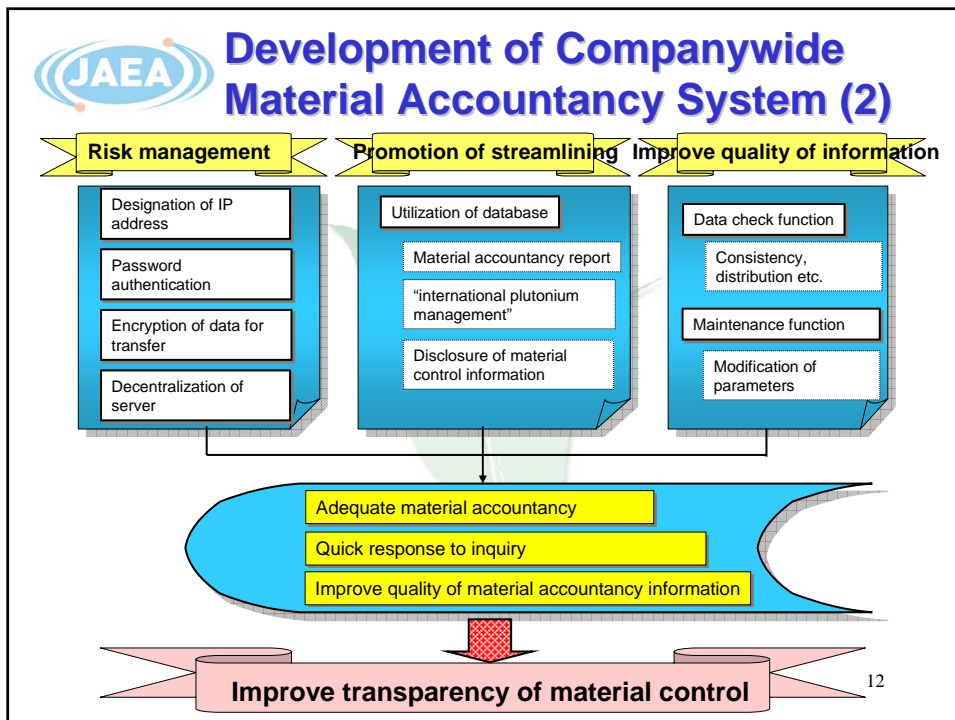
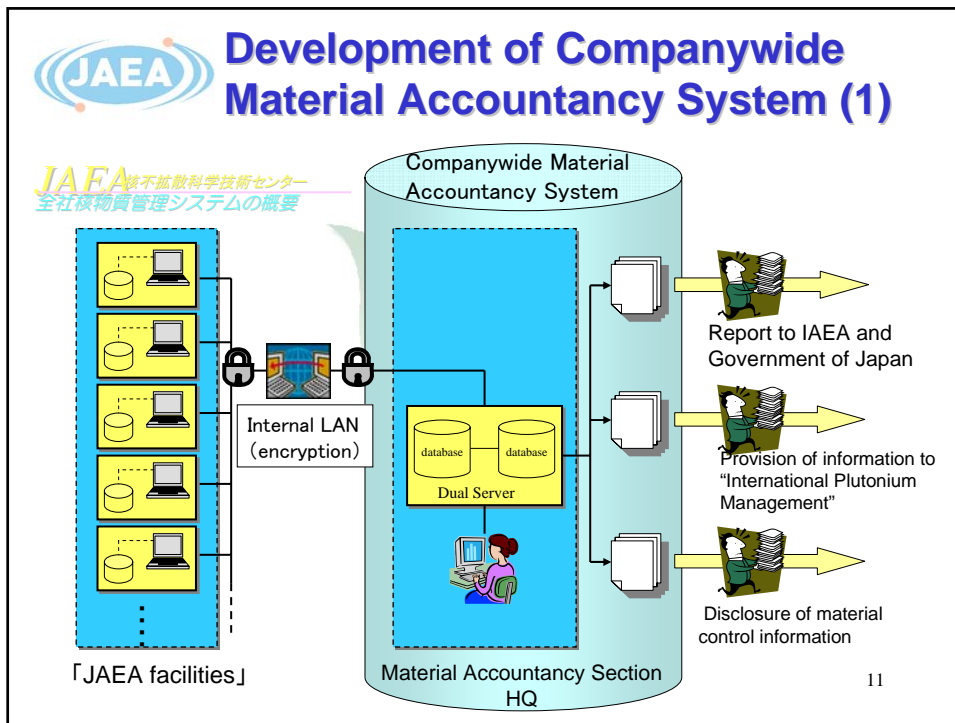
Establishment of Effective Safeguards Approach for Nuclear Fuel Cycle Facilities (4)

Advanced Reactors



Trends of Safeguards R&D

- **Beginning to 1980's**
 - Establishment of reliable safeguards system for nuclear cycle facilities
 - Evaluation of applicability of safeguards system
 - **1990's**
 - Resolution of issues
 - Improvement for strengthen safeguards system
 - **2000's**
 - Adapt for large-scale facility and advanced nuclear energy system
 - Promotion of streamlining
- Green arrows indicate the flow from the 1980's to the 1990's, and from the 1990's to the 2000's.





Status of Additional Protocols

- The Model Additional Protocol was established in May 1997
- Australia is the first state to enter into force; in December 1997
- Japan is the eighth state
- 69 states and 1 party (Euratom) entered into force as of October 18, 2005

	State	Board Approval	Date signed	In Force
1	Australia	23-Sep-97	23-Sep-97	12-Dec-97
2	Jordan	18-Mar-98	28-Jul-98	28-Jul-98
3	Holy See	14-Sep-98	24-Sep-98	24-Sep-98
4	New Zealand	14-Sep-98	24-Sep-98	24-Sep-98
5	Uzbekistan	14-Sep-98	22-Sep-98	21-Dec-98
6	Indonesia	20-Sep-99	29-Sep-99	29-Sep-99
7	Monaco	25-Nov-98	30-Sep-99	30-Sep-99
8	Japan	25-Nov-98	4-Dec-98	16-Dec-99
9	Hungary	25-Nov-98	26-Nov-98	4-Apr-00
10	Poland	23-Sep-97	30-Sep-97	5-May-00
11	Norway	24-Mar-99	29-Sep-99	16-May-00
12	Lithuania	8-Dec-97	11-Mar-98	5-Jul-00
13	Croatia	14-Sep-98	22-Sep-98	6-Jul-00
14	Romania	9-Jun-99	11-Jun-99	7-Jul-00
15	Slovenia	25-Nov-98	26-Nov-98	22-Aug-00
16	Canada	11-Jun-98	24-Sep-98	8-Sep-00
17	Bulgaria	14-Sep-98	24-Sep-98	10-Oct-00
18	Azerbaijan	7-Jun-00	5-Jul-00	29-Nov-00
19	Bangladesh	25-Sep-00	30-Mar-01	30-Mar-01
20	Latvia	7-Dec-00	12-Jul-01	12-Jul-01
21	Turkey	7-Jun-00	6-Jul-00	17-Jul-01

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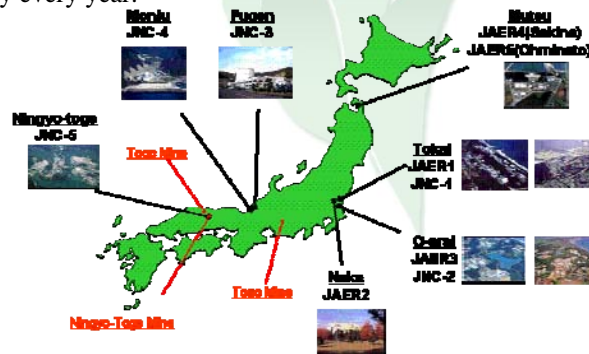
IAEA's Expanded Declaration

- Additional Protocol, Article 2~3
- Domestic Law, Article 67 and Cabinet Order, Article 7
- Initial Declaration; reported on the end of January 2000
- Annual Declaration; end of January every year.

Initial Declaration of IAEA

- Sites: 10 (160)
- Buildings: 1,257 (5,301)
- Uranium Mines: 3 (3)

(): Entire Japan



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Qualified for Integrated Safeguards

- IAEA reached the Conclusion, June, 2004: “Neither diversion of nuclear materials nor undeclared nuclear materials/activities in Japan”
- Integrated Safeguards started in Japan from Sept. , 2004, as the first non nuclear weapon state with full-scale nuclear fuel cycle



“I am pleased to note that Japan has become the first State with an advanced nuclear cycle to qualify for integrated safeguards”

Statement by IAEA DG El Baradei to 2004 IAEA General Conference (20 September 2004)

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Introduction of Integrated Safeguards in Japan

Type of facilities in which Integrated Safeguards started

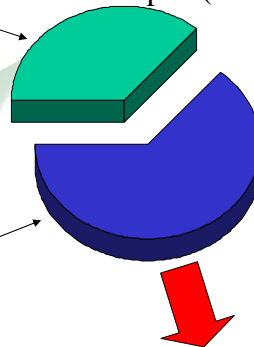
LWRs w/o MOX, SFSFs, RRCAs (Sep. 2004)

LWRs w/ MOX, LEU fuel fabrication facilities (Jan. 2005)

Type of facilities waiting for Integrated Safeguards

MOX reactors and fuel fabrication facilities
Uranium enrichment and Reprocessing facilities and other

Percentage in inspection efforts in Japan (2003)

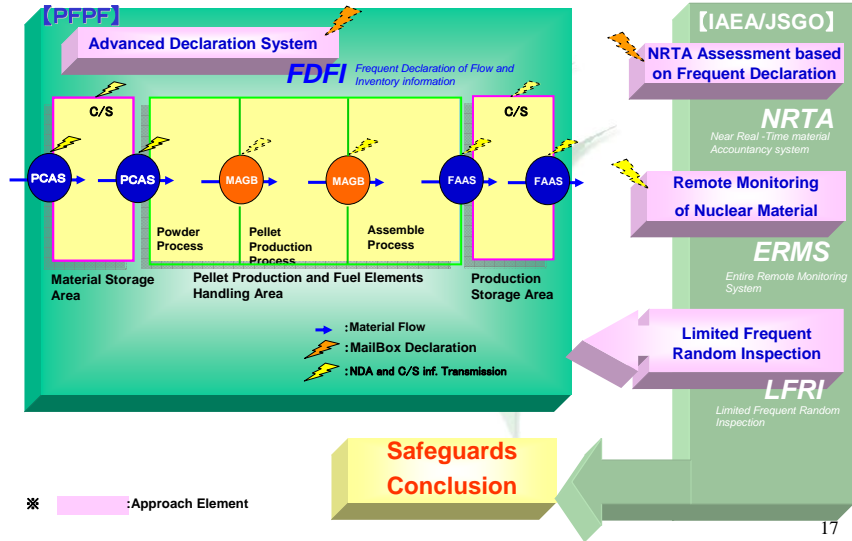


More than 10% of inspection efforts in the world

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Proposed Integrated Safeguards System for PFPF

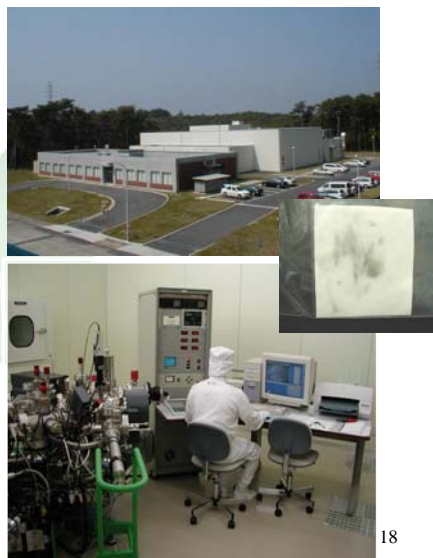


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Development of Environmental Sampling

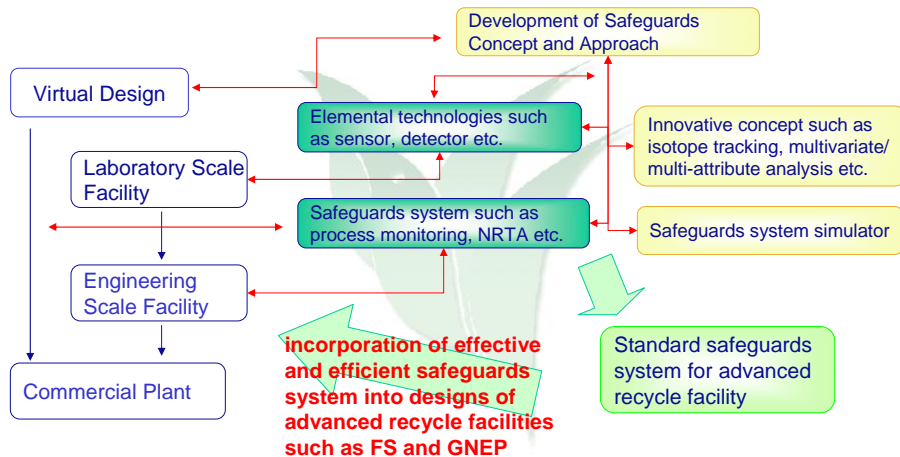
- ◆ Technical development of Environmental Sample Analysis at clean lab (CLEAR).
- ◆ International contribution as a member of IAEA Network Lab.
- ◆ Basic study on Wide-area Environmental Sampling
- ◆ Application to nuclear forensics (under planning)



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Safeguards for Advanced Recycle Facility



In May 6, Minister of MEXT Kenji Kosaka and Secretary of U.S. DOE Samuel Bodman agreed to cooperate in five areas for the Global Nuclear Energy Partnership (GNEP). "Advanced Safeguards" is one of the area agreed to cooperate.

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Concluding Remarks

- JAEA has long been developing reliable and effective safeguards systems for nuclear fuel cycle facilities with IAEA and GOJ under collaboration with research laboratories in other countries.
- Japan has made effort to implement faithfully the safeguard systems in the country, with good communication with IAEA, contributing to maintain transparency of the nation's nuclear program.
- Japan recognizes the peaceful use of nuclear energy can be realized that is not inconsistent with the nonproliferation regime with effective implementation of international safeguard systems, export control, etc.
- We believe further efforts are necessary to develop effective and efficient safeguard systems for the advanced fuel cycle technology, collaborating with US and other countries.

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Abbreviation

BBAS:	Big Box Assay System	NRTA :	Near Real Time Accountancy
CFRS:	Core Fuel Radiation System	NWAS:	Ningo-toge Waste Assay System
C/S:	Containment and Surveillance	OSL:	On Site Laboratory
ENMC:	Epithermal Neutron Multiplicity Counter	PNUH:	Portable Neutron Uranium Hexafluoride
FA:	Facility Attachment	RMS:	Remote Monitoring System
FS:	Feasibility Study on Commercialize Fast Reactor Cycle System cycle	RCCA:	Research Reactor and Critical Assemblies
FUGM:	FUGen Gate Monitor	SBAS:	Super Glove Box Assay System (GBAS)
GNEP:	Global Nuclear Energy Partnership	SFSF:	Spent Fuel Storage Facility
HBAS:	Holdup Blender Assay System, Holdup glove Box Assay System	SMMS:	Solution Measurement and Monitoring System
HMMS:	Hulls Monitoring and Measurement System	TAMS:	TANk measurement and Monitoring System
HSP:	Hexapartite Safeguards Project	TASTEX:	Tokai Advanced Safeguards Technology EXercise
iPCAS:	Improved Plutonium Canister Assay System (PCAS)	UFFM:	Unattended Fuel Flow Monitor
JASPAS:	Japan Support Programme for Agency Safeguards	VWCC:	Vitrified Waste Canister Counter
LEU:	Low Enriched Uranium	WCAS:	Waste Crate Assay System
LWR w/ MOX:	Light Water Reactor with MOX	WDAS:	Waste Drum Assay System
LWR w/o MOX:	Light Water Reactor without MOX		

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