

Japan's Nuclear Fuel Cycle in the 21st Century

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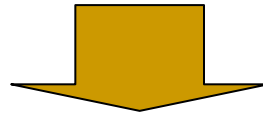


1. Strategy of Spent Fuel Treatment

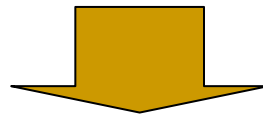


Choice of Spent Fuel Treatment

**~ 1,000 tons of Spent Fuel / Year
from LWR 55 units**



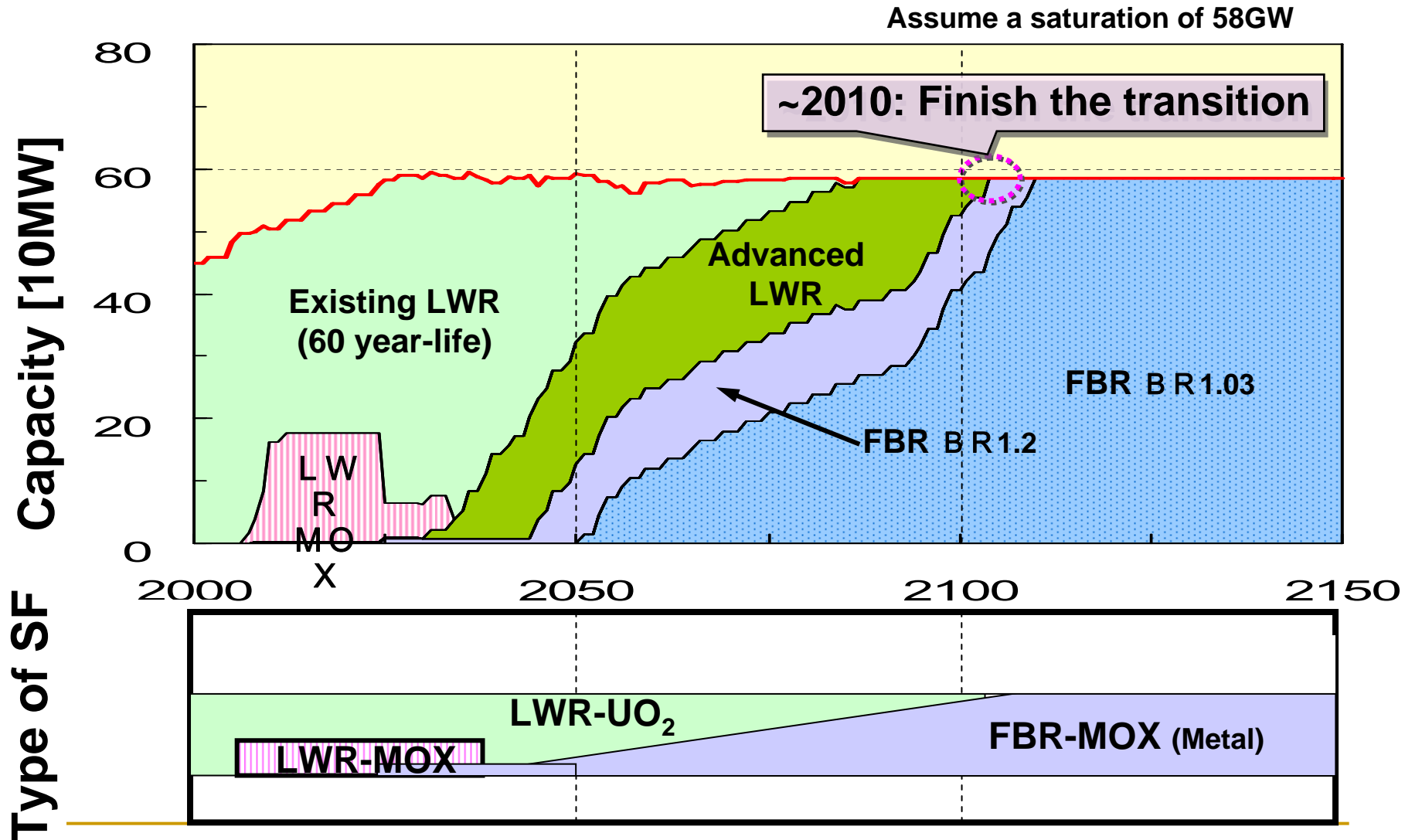
**Reprocessing
with Interim Storage**



- 1) Single Use of U-Pu by LWR system**
- 2) Multiple Use of U-Pu-MA by FBR system**

Japan's long-term Nuclear Energy Policy

Capacity, Type of NPPs & SF

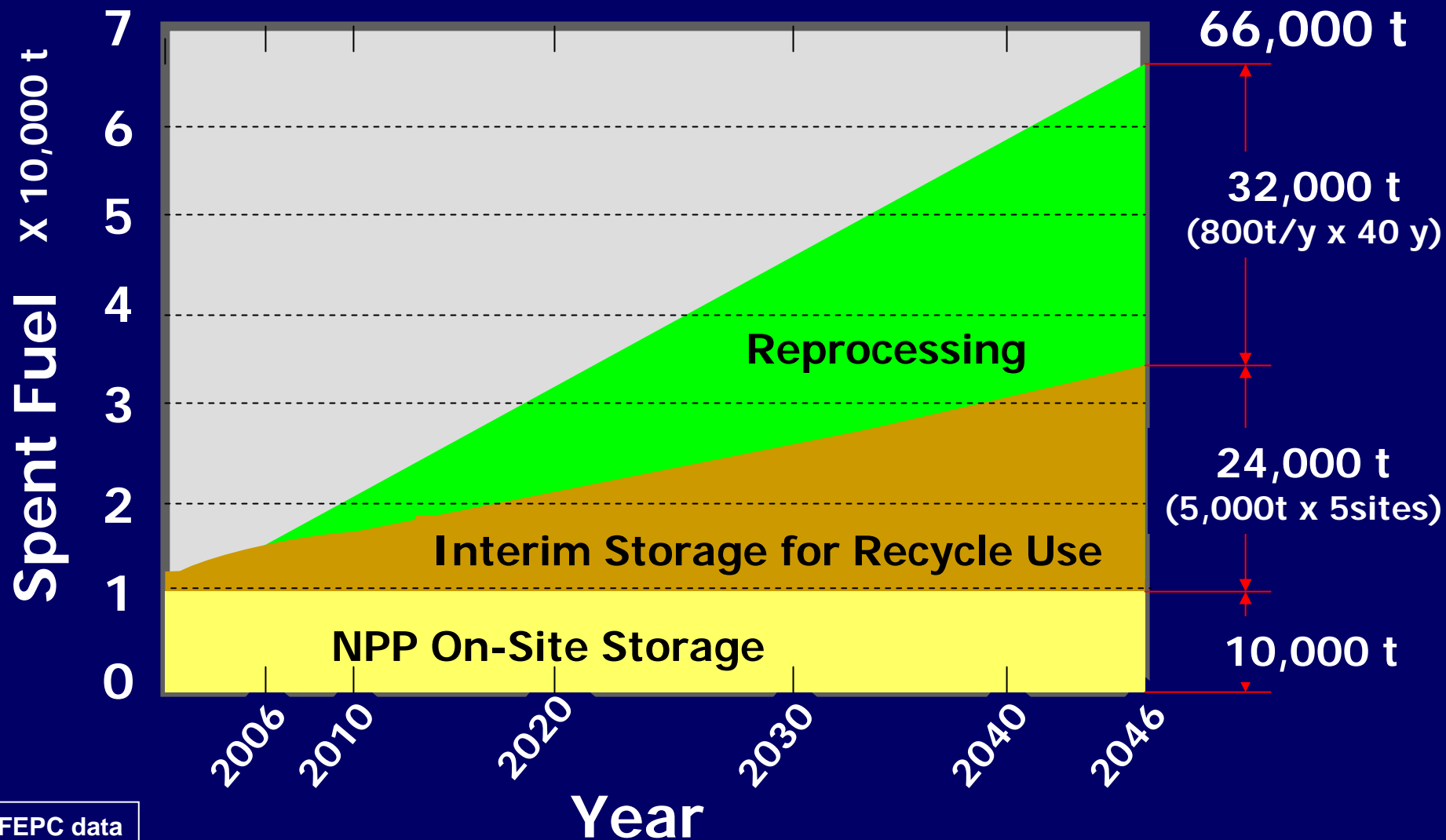




2. Complete the current LWR closed cycle including interim storage



Current Plan of Japan's LWR Spent Fuel Management



Japan's LWR Fuel Cycle

To close the cycle by early 2010s

LWR Spent Fuels
1000 ~ 900 tHM/y

A Couple of
Interim Storage
Facilities



Mutsu city
Recycle Fuel Storage
Center : 5000 t

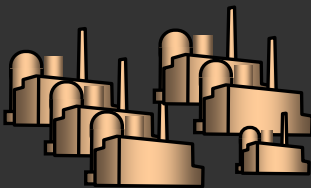


JNFL RRP : 800 tHM/y



JNFL MOX : 130 tMOX/y

U
Fuels



NPP 55 units
LWR-MOX 16~18 units : Start around 2010

Waste Treat.

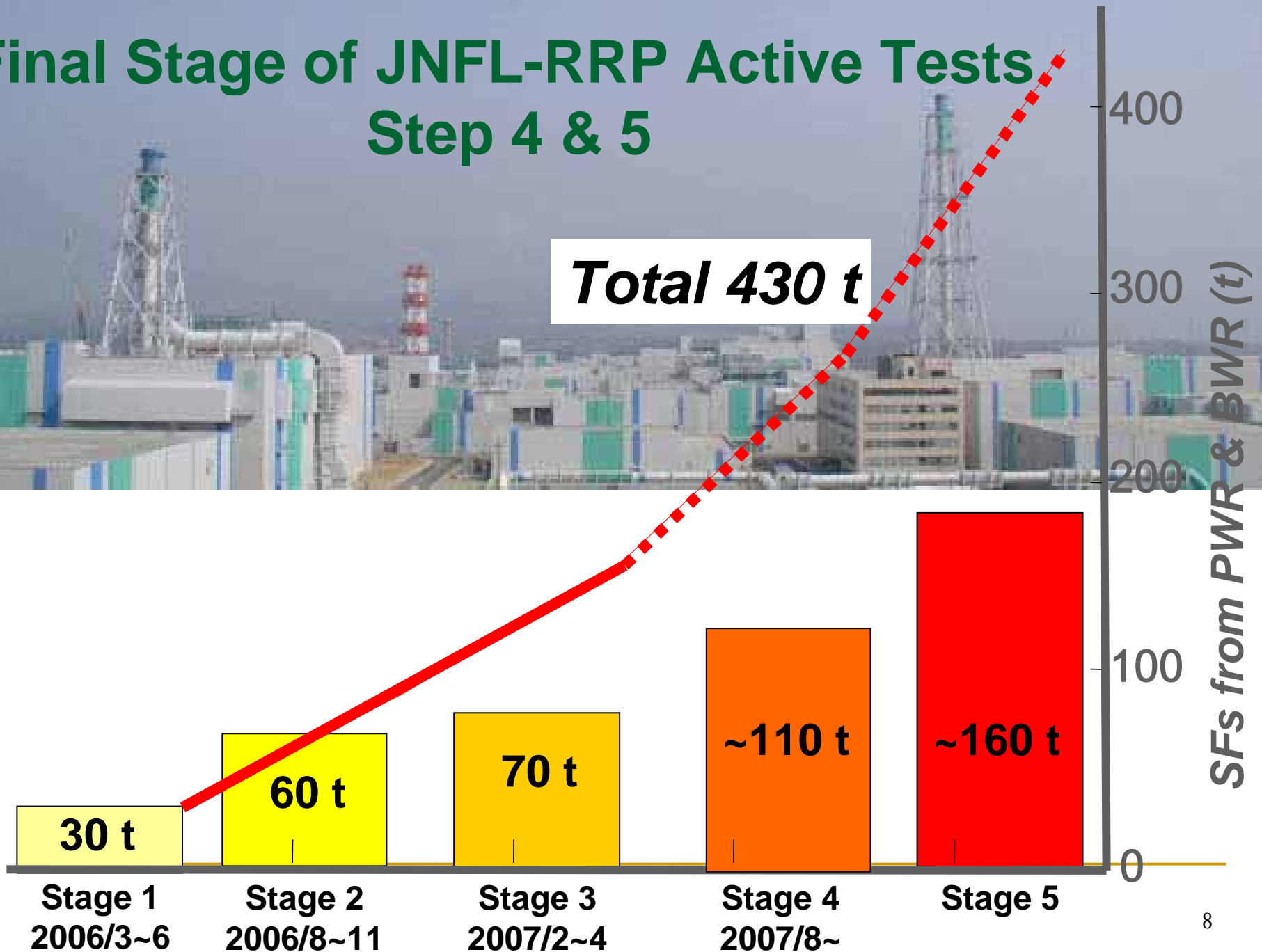
LWR-MOX

Shallow, Mid-depth, Deep-geological
Disposal

Final Stage of JNFL-RRP Active Tests

Step 4 & 5

Total 430 t



Issues to be solved for Japan's Current Fuel Cycle

Focus Plant Operations

- Safe, reliable & scheduled operation
- Construction of J-MOX plant
- Preparation of another interim storage facilities

Fissile Material Management

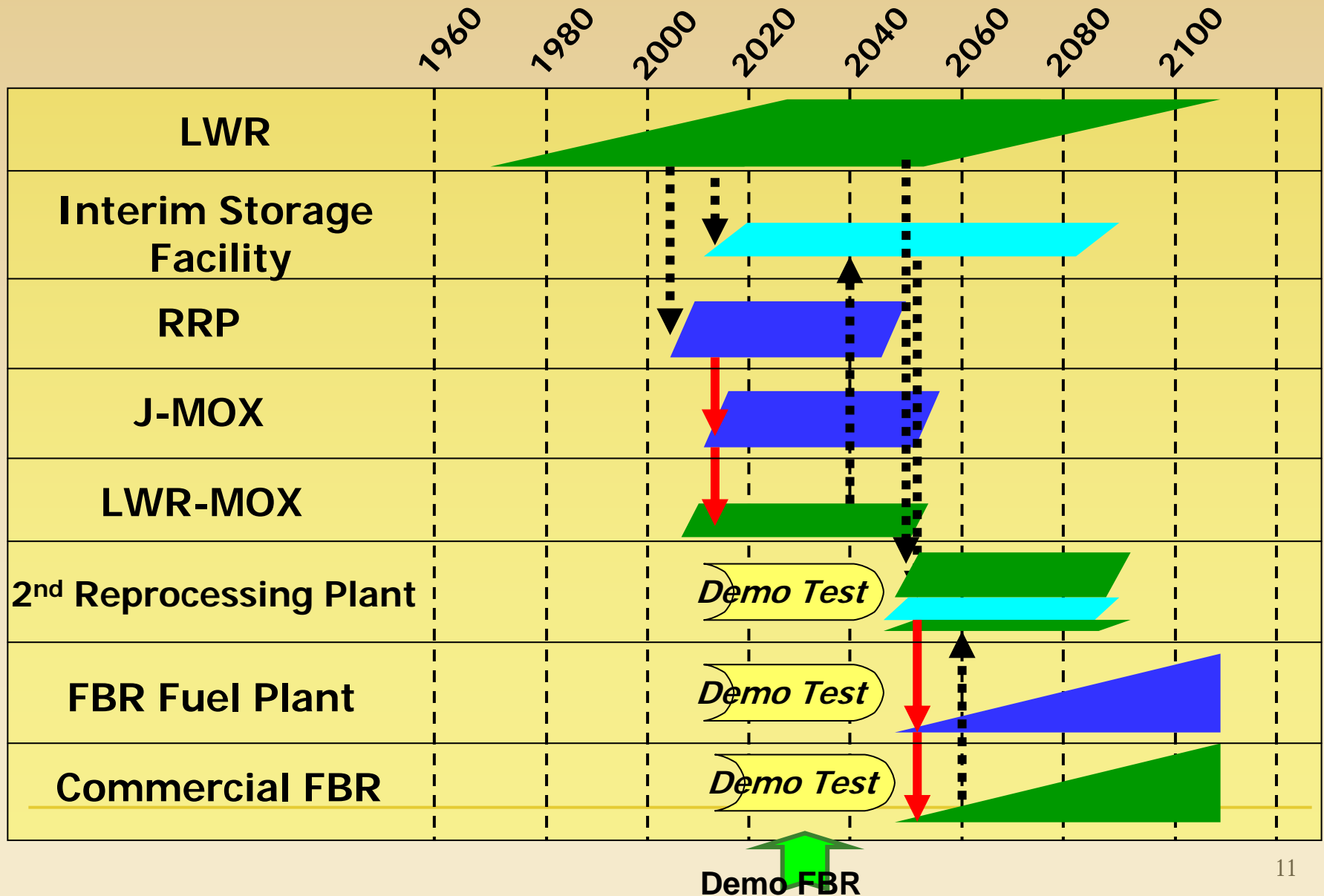
- Application for integral SG by IAEA
- Public acceptance for implementation of LWR- MOX use

Waste Treatment & Disposal

- Industrial approach for treatment and disposal of HLW & TRU wastes
- Site proposal and its public acceptance for geological permanent disposal

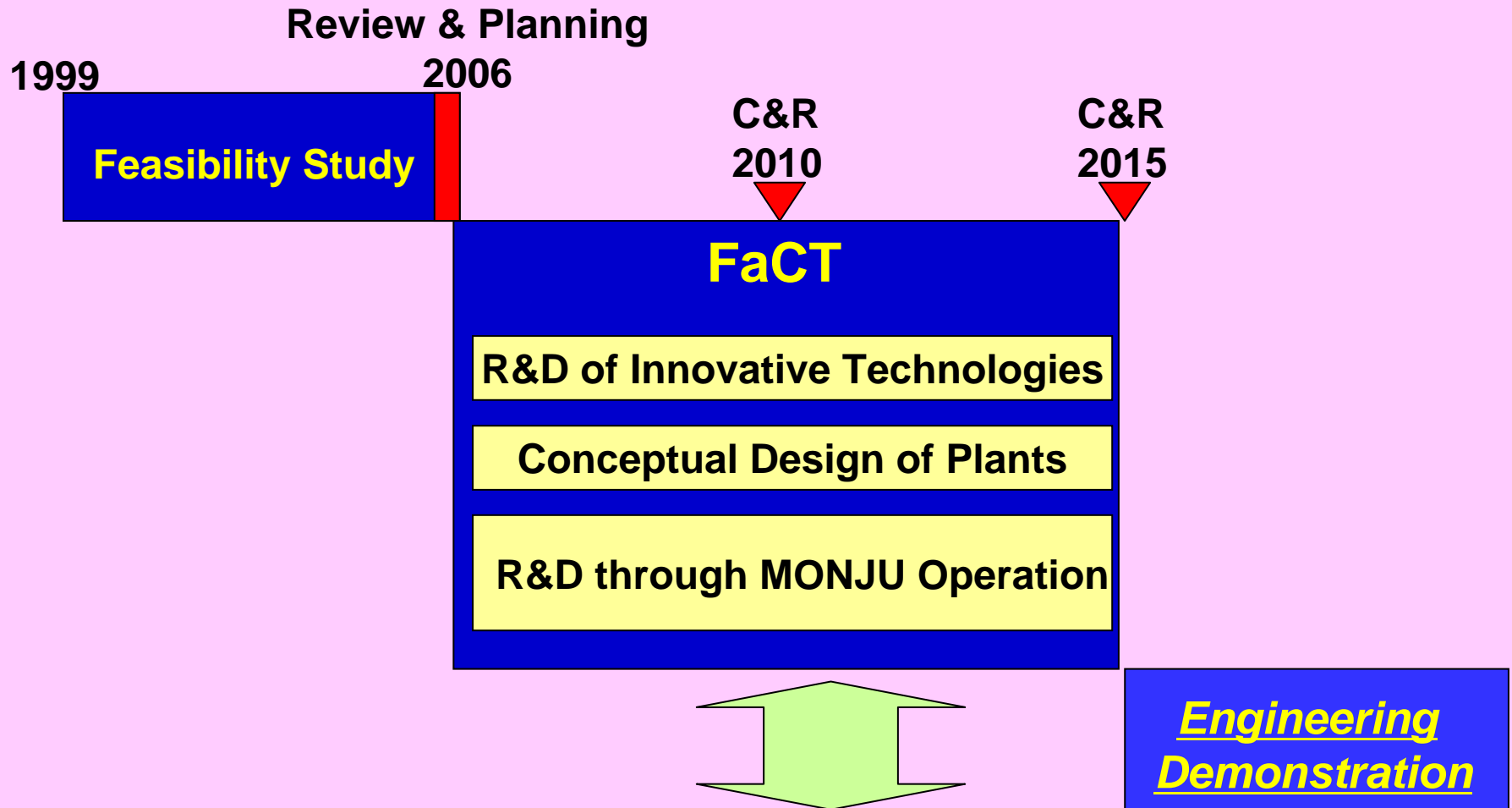
3. Prepare the Transition from current LWR cycle to Next FBR cycle

Japan's Transition Plan from LWR to FBR Cycle



FBR Cycle Program is initiated by FaCT*

* Fast Reactor Cycle Technology Development Projects



International Collaborations (GNEP, GEN-IV, INPRO....)

FaCT focus the Selected Options

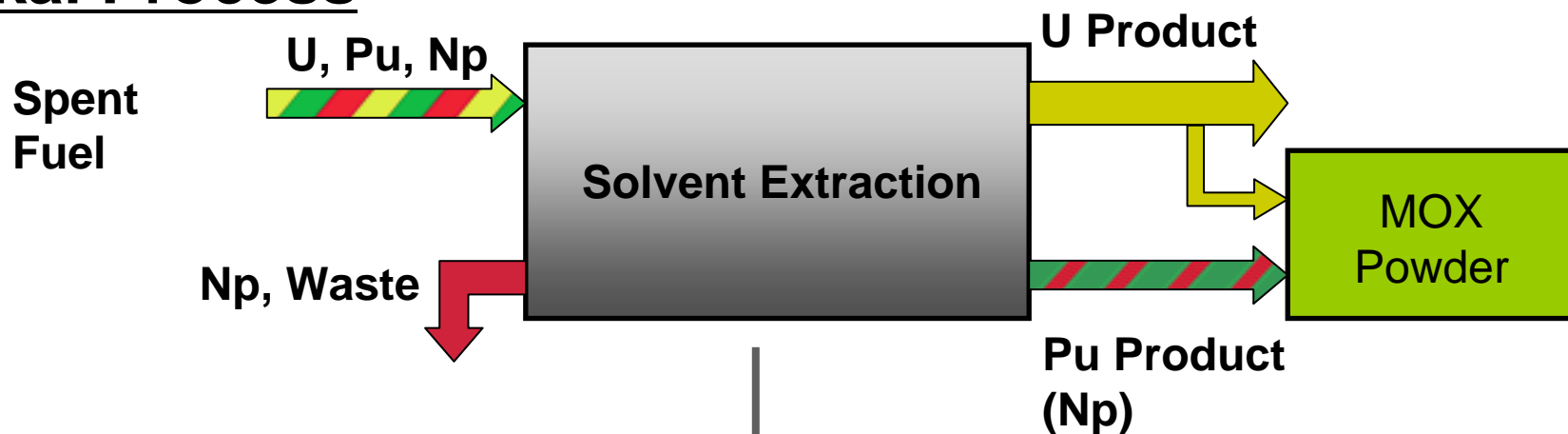
	<i>Reactor</i>	<i>Reprocessing</i>	<i>Fuel Fabrication</i>
<i>Primary Concept</i>	Sodium cooled (MOX fuel)	Advanced aqueous process	Simplified pelletizing process
<i>Secondary Concept</i>	Sodium cooled (Metal fuel)	Electro- metallurgical process	Injection casting

Examples of Processes Under R& D

	France		US		Japan
Process	COEX	GANEX	UREX+	Pyroprocess	FaCT Process
Type of SF	LWR	LWR FR	LWR ABR	ABR	FBR
Products	U, U/Pu, FP/MA	U, An, FP	U, Tc, Cs/Sr, TRU, FP	U, TRU, FP	U, U/Pu/Np, Am/Cm, FP
Recycled Fuel	U/Pu-MOX	U/Pu/MA	U/TRU	U/TRU	U/Pu/MA

U, Pu, Np Co-Extraction Development

Tokai Process



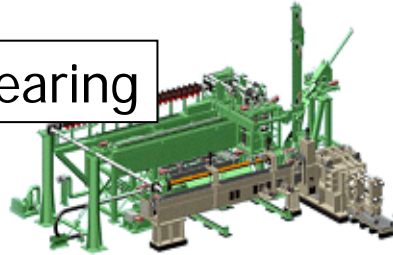
Control of temperature and/or acidity

Advanced Process



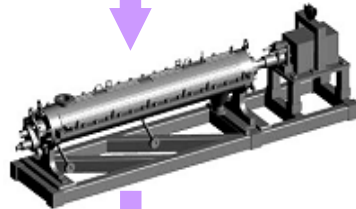
Process Equipments for Advanced Cycle R&D

Disassembling & Shearing

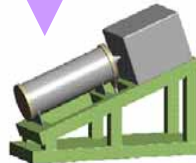


Pin fabrication & bundle assembly

Dissolution



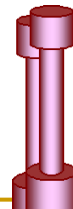
Crystallization



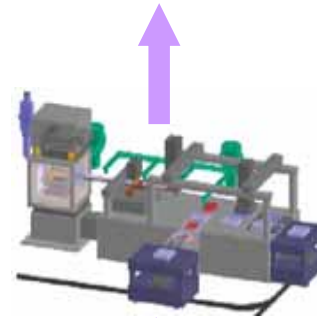
Co-extraction



Adjustment of Pu content

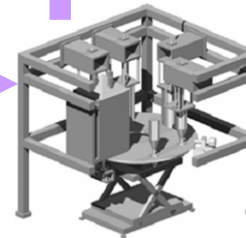


High-level liquid waste



Molding & Sintering

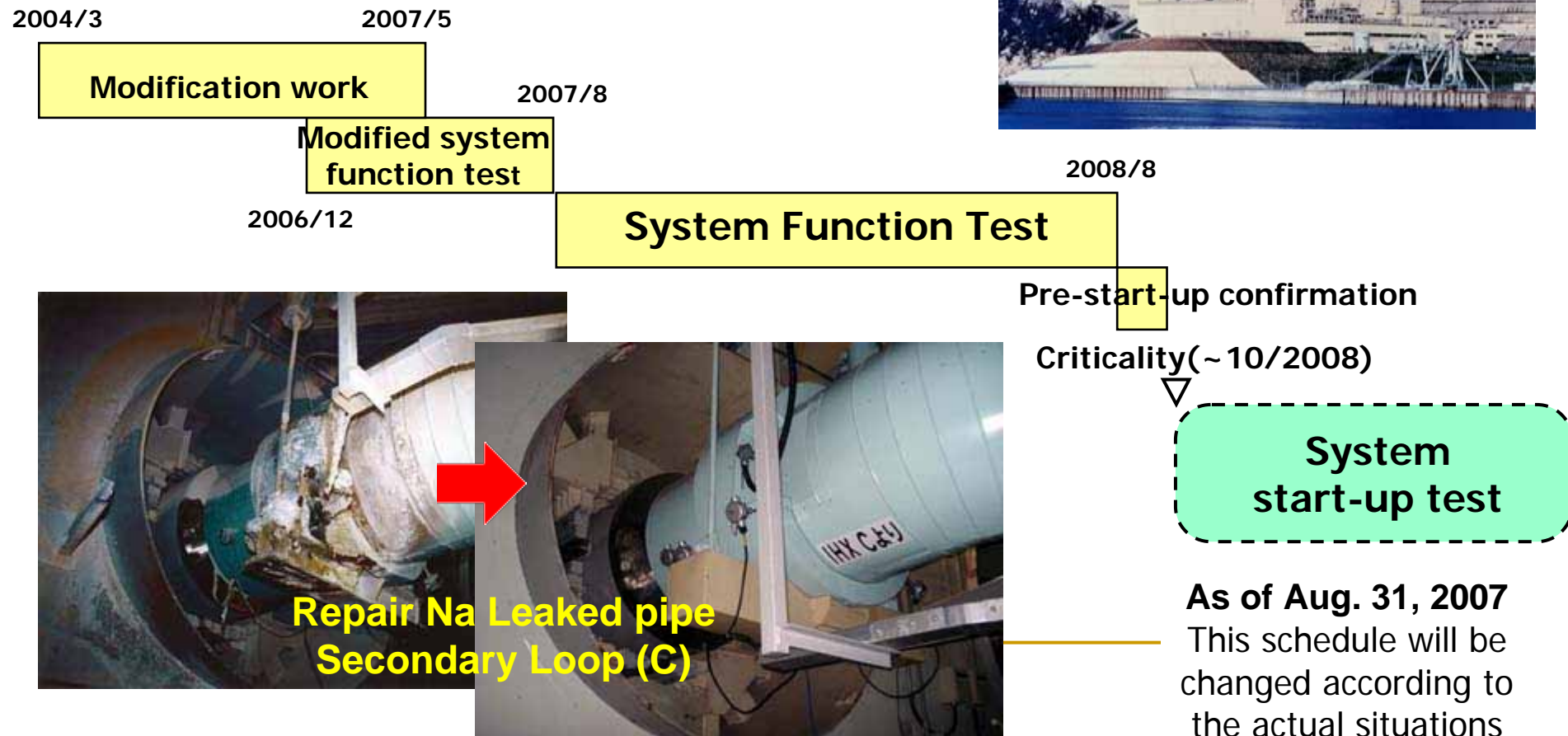
MA-MOX Conversion & Granulation



MA recovery by extraction chromatography

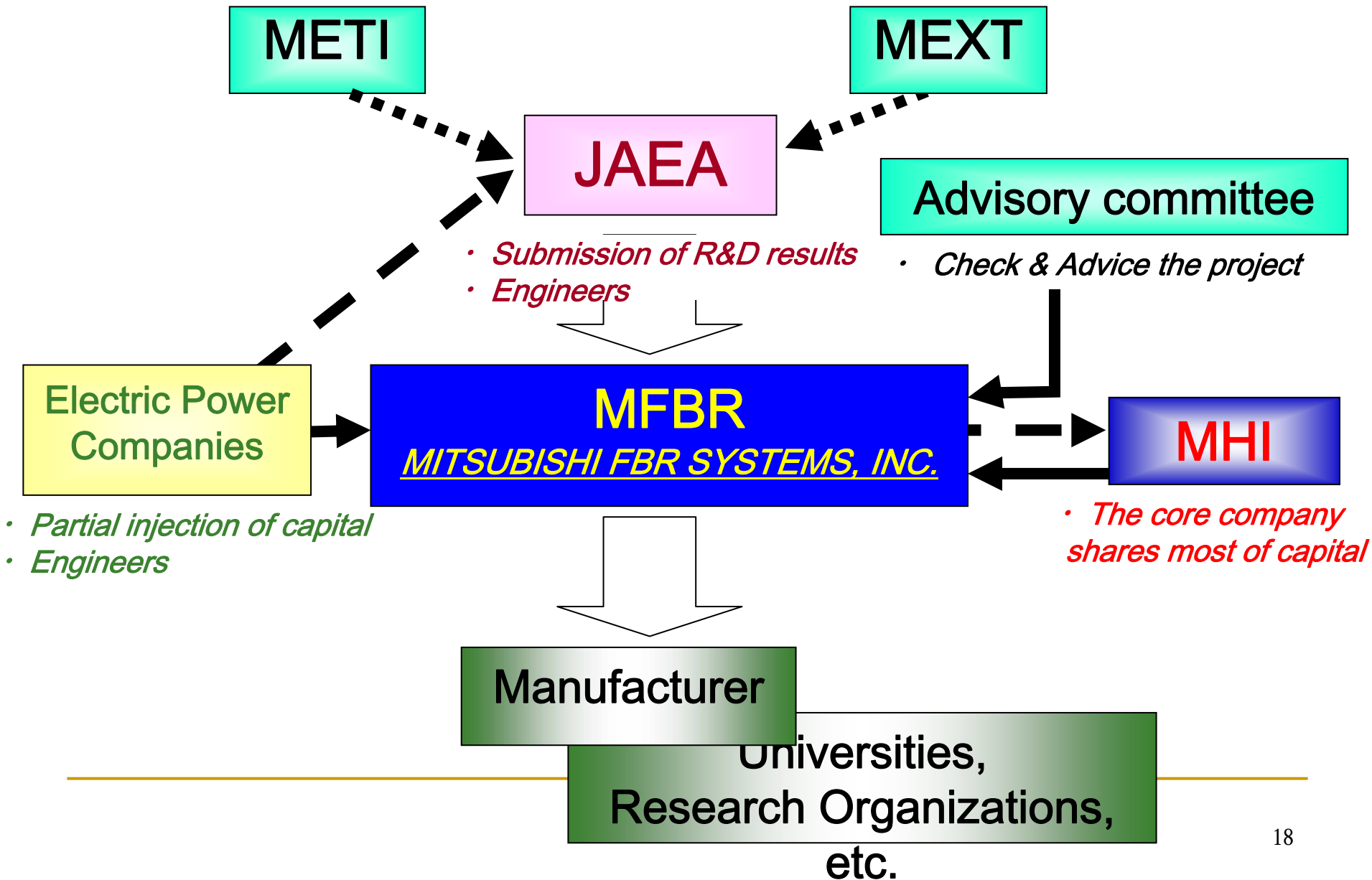
Start in JAEA FBR Cycle Projects

MONJU focus on System Function Test



As of Aug. 31, 2007
This schedule will be
changed according to
the actual situations

FBR R & D Framework in Japan



Sustainable Development for Reprocessing Technology in Japan

LWR SF



Industry

(Matured 3rd Generation)

France
UP2-400 since 1976
UP2-800 since 1994,
UP3 since 1989



JAEA TRP
since 1981

210t/y



JNFL RRP
since 2006

800t/y



FBR SF

Labo.



Engineering



Demo.

JAEA CPF
since 1982



JAEA NUCEF
since 1994



RETF
since ~2015

1t/y



GNEP ?

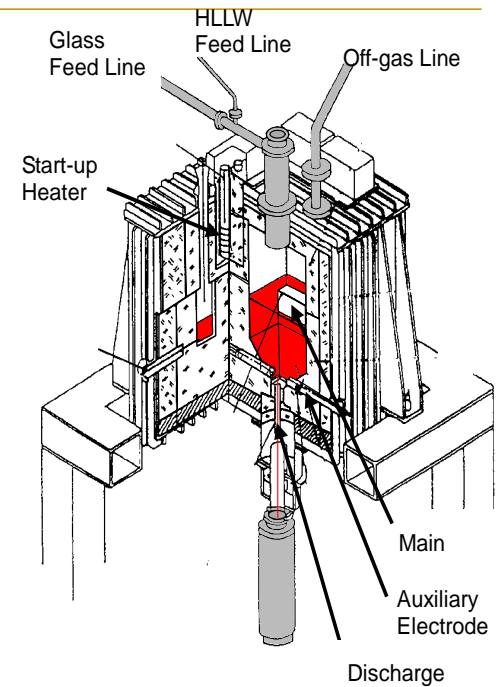




**Inspection & Repair
Tool for Dissolver**



**Ti-5Ta Evaporator
for Acid Recovery**



Vitrification in TVF



**Seismic Isolation System
(Rubber Bearing & Lead Damper)**

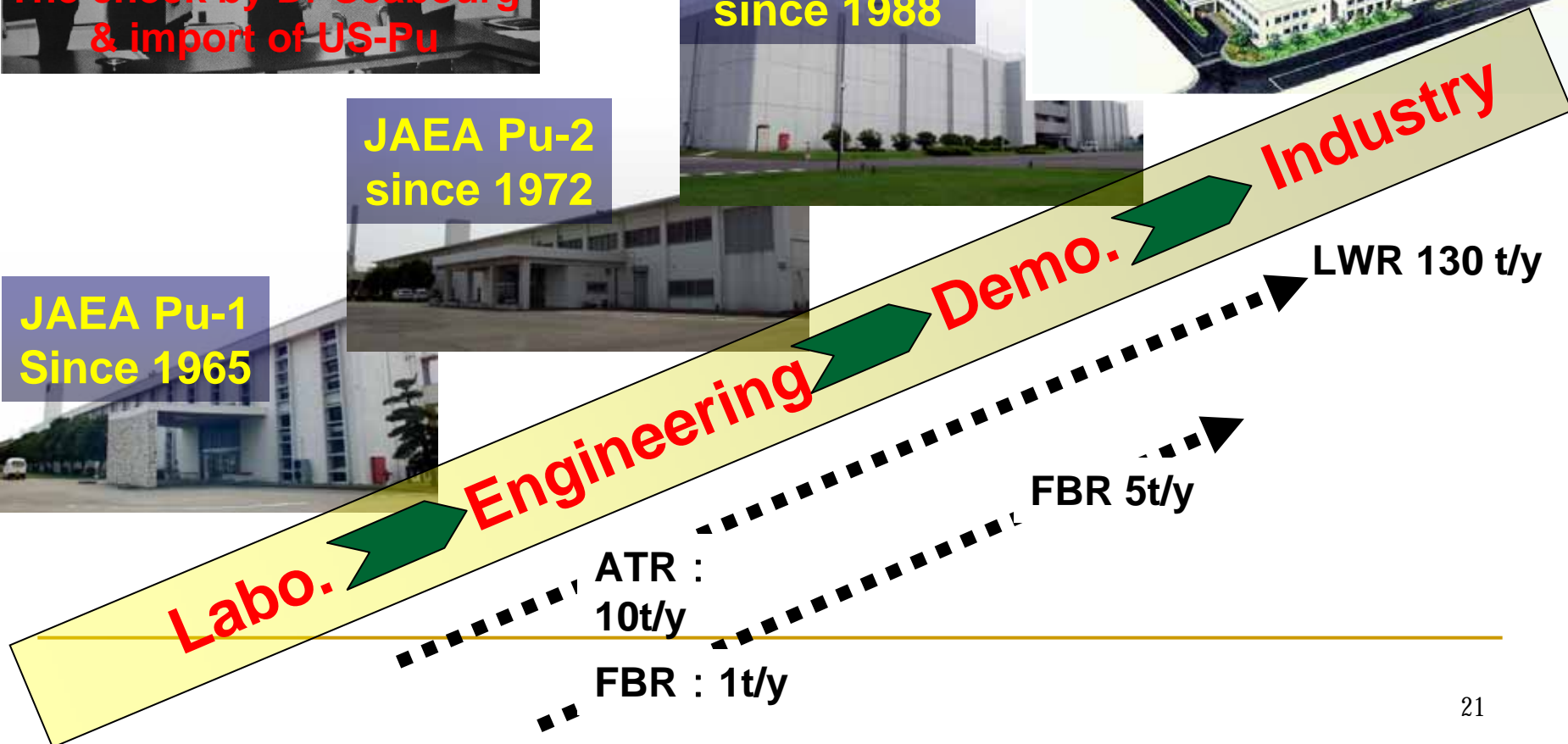


**Micro-Wave
Co-Conversion System
(Pu-U Denitrated Cake)**

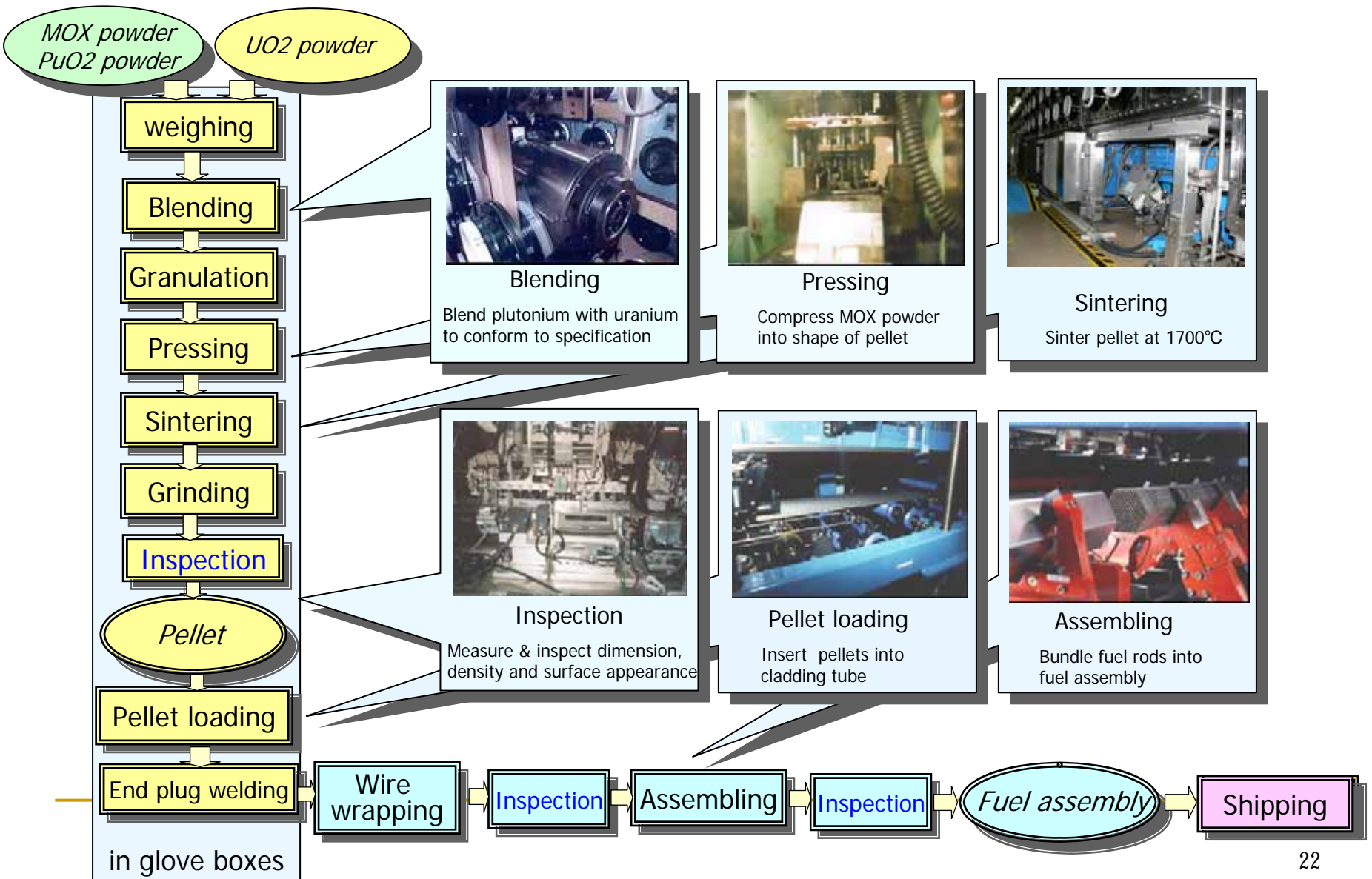


**Assay System for
Low-Level Waste Drum**

Sustainable Development for MOX Fuel Fabrication Technology in Japan



Fabrication Process Flow



Material Accounting and Safeguards



SBAS
(Super Glove Box
Assay System)



Material Accounting



WDAS
(Waste Drum Assay System)

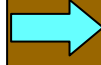
PCAS
(Plutonium Canister
Assay System)



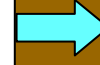
Receipt



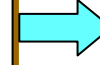
Feed Storage



Process



Product Storage



Shipment

FAAS
(Fuel Assembly
Assay System)



Containment / Surveillance System
Non Destructive Assay System



MAGB
(Material Accountability
Glove Box Assay System)

Conclusions

Global approach for sustainable future

- 1) Scenario study on global approach for spent fuel management under increasing NPP more than 1000 units**
- 2) Develop & demonstration of innovative technologies under GNEP**
- 3) Keep the supporting base technologies with transfer to the next generations**