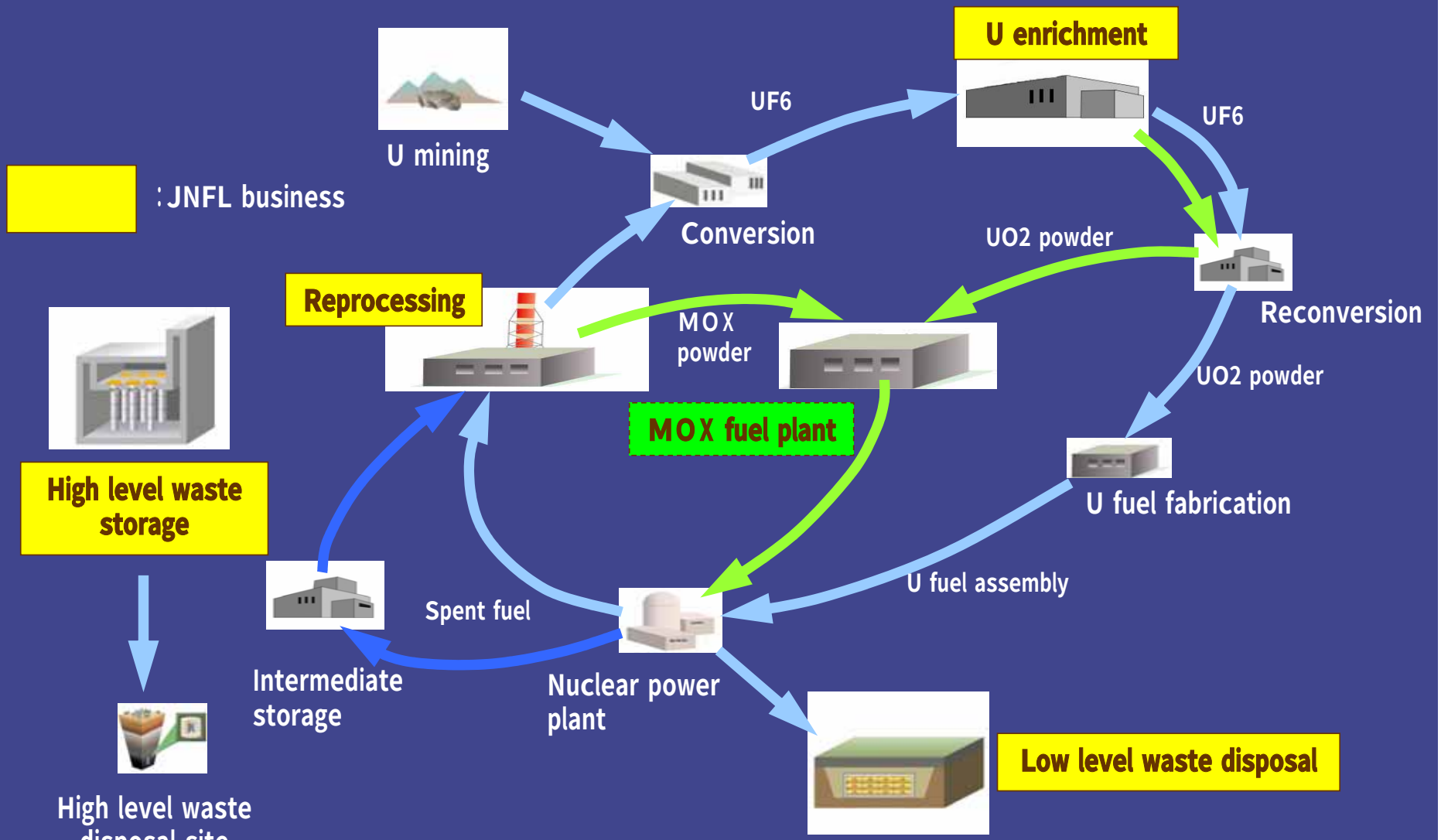
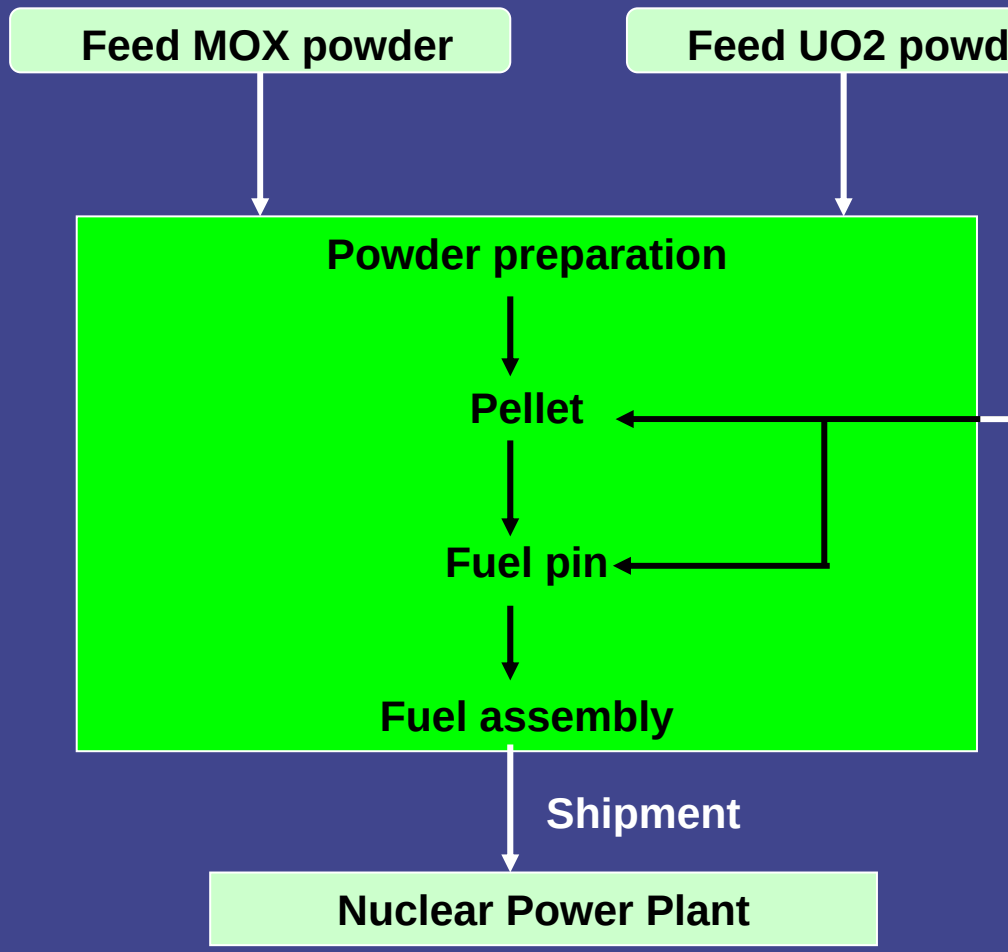
Outline of the Rokkasho MOX Fuel Fabrication Plant

Japan Nuclear Fuel Ltd.

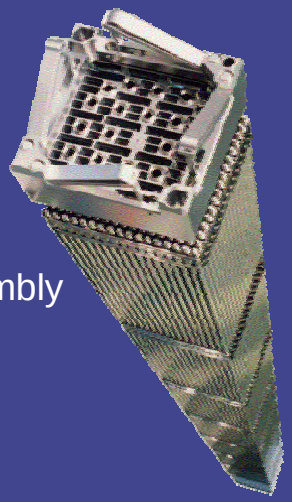
JNFL Business and JMOX Roll



Scope of JMOX Business



- Hardware (Cladding tube, Grid, Nozzle, Spring, etc.)
- U fuel rod (for BWR Fuel Assembly)



PWR fuel assembly

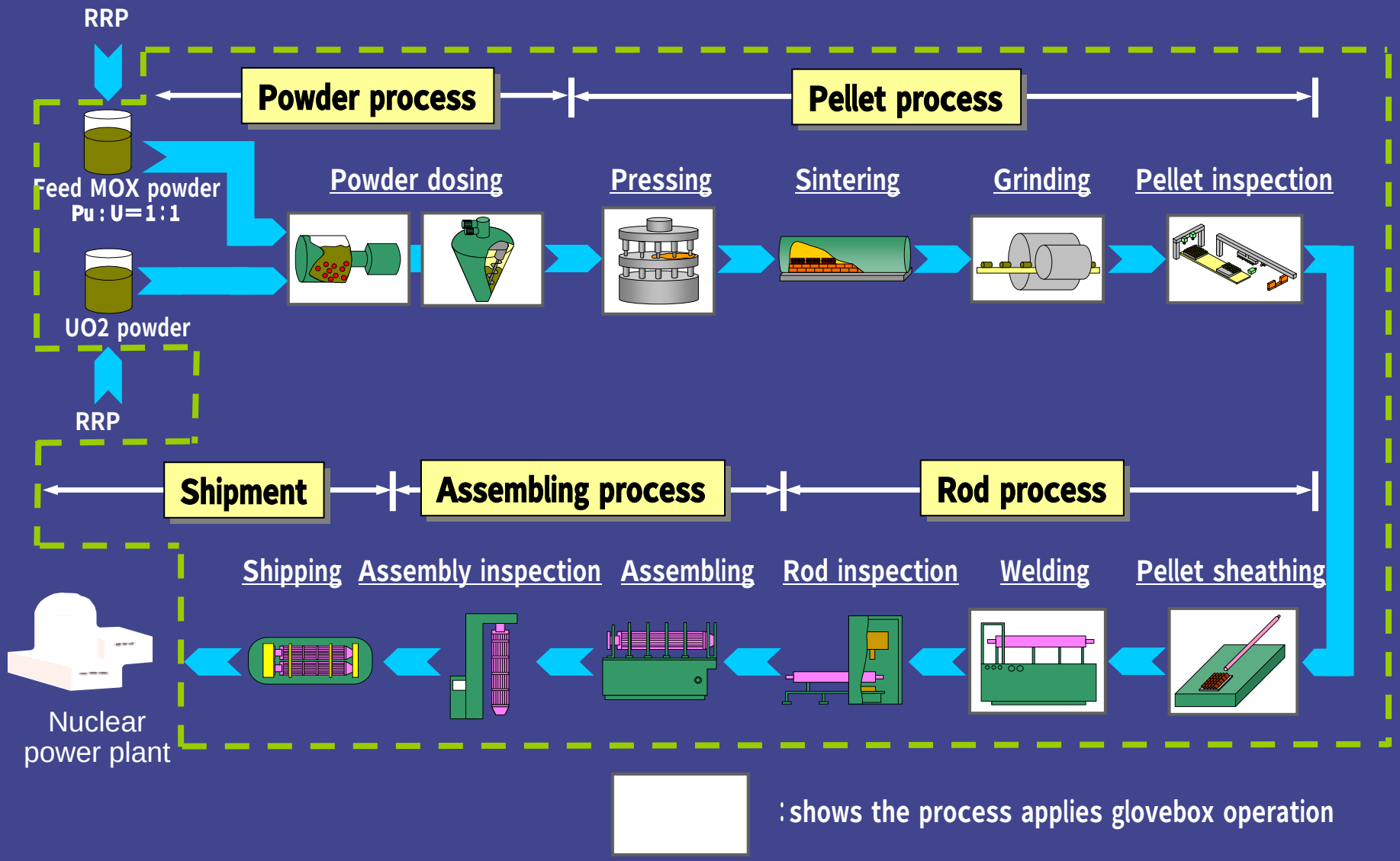
JMOX business: To fabricate MOX fuel (both for BWR and PWR) feeding MOX powder recovered at RRP and UO2 powder for dilution, through to ship them to domestic nuclear power plants.

Policy on Transplanting MOX Fabrication Technology

JMOX project is promoted on a policy that it should stand on technologies widely proven domestically and abroad.

Field of technology	Contents of technology	Character of technology	Who's technology
Safe handling of Pu	Confinement, Radiation shielding, Criticality prevention, Safe operation with gloves	Basic technology to operate the MOX business	JAEA
Accountability /Safeguards	To prove that SNM is limited for peaceful use	Inevitable technology to achieve MOX business in Japan	JAEA
MOX fuel fabrication for LWR	Technology for equipment selection and plant operation to produce high quality MOX fuel	To achieve commercial scale production	JAEA Domestic U fabricator Foreign MOX fabricator

MOX Fuel Fabrication Process Flow



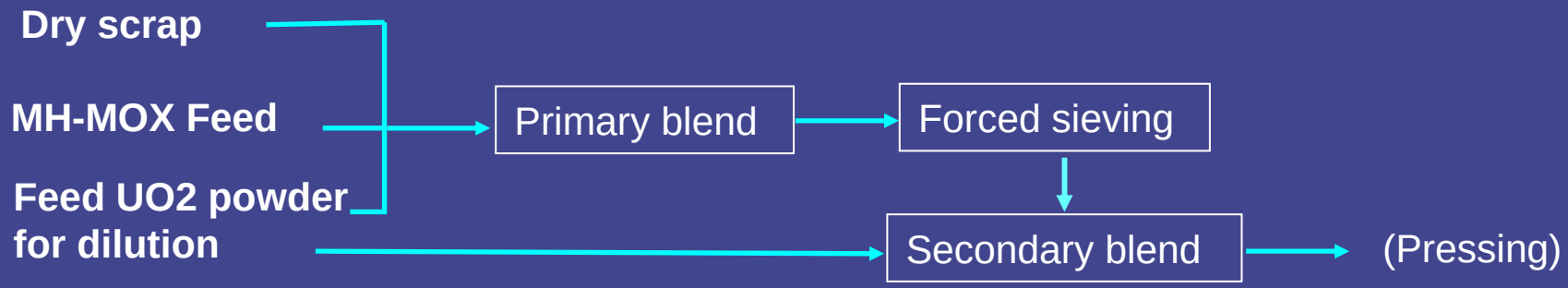
Feed MOX Powder to JMOX (MH-MOX)

- MH-MOX means MOX powder converted by Microwave Heating Direct De-nitration method.
- MH technology, applied in RRP, is the ways in which U and Pu mixed solution is converted into mixed oxide having merits that the way is simple and powder has good character, although waste to be generated is rather small.
- JAEA developed the MH method because of world requirement on nuclear nonproliferation.

Powder Dosing Process (MIMAS technology)

- JNFL decided applying MIMAS technology that contributes great deal to MELOX's good running in JMOX key process.

- MIMAS technology is two steps powder mixing technology. In the 1st step, so called "master powder" having 30% of plutonium content is dosed and milled well, then, at the 2nd step, UO2 powder is put to the master powder to dilute the plutonium content defined as vender specification.

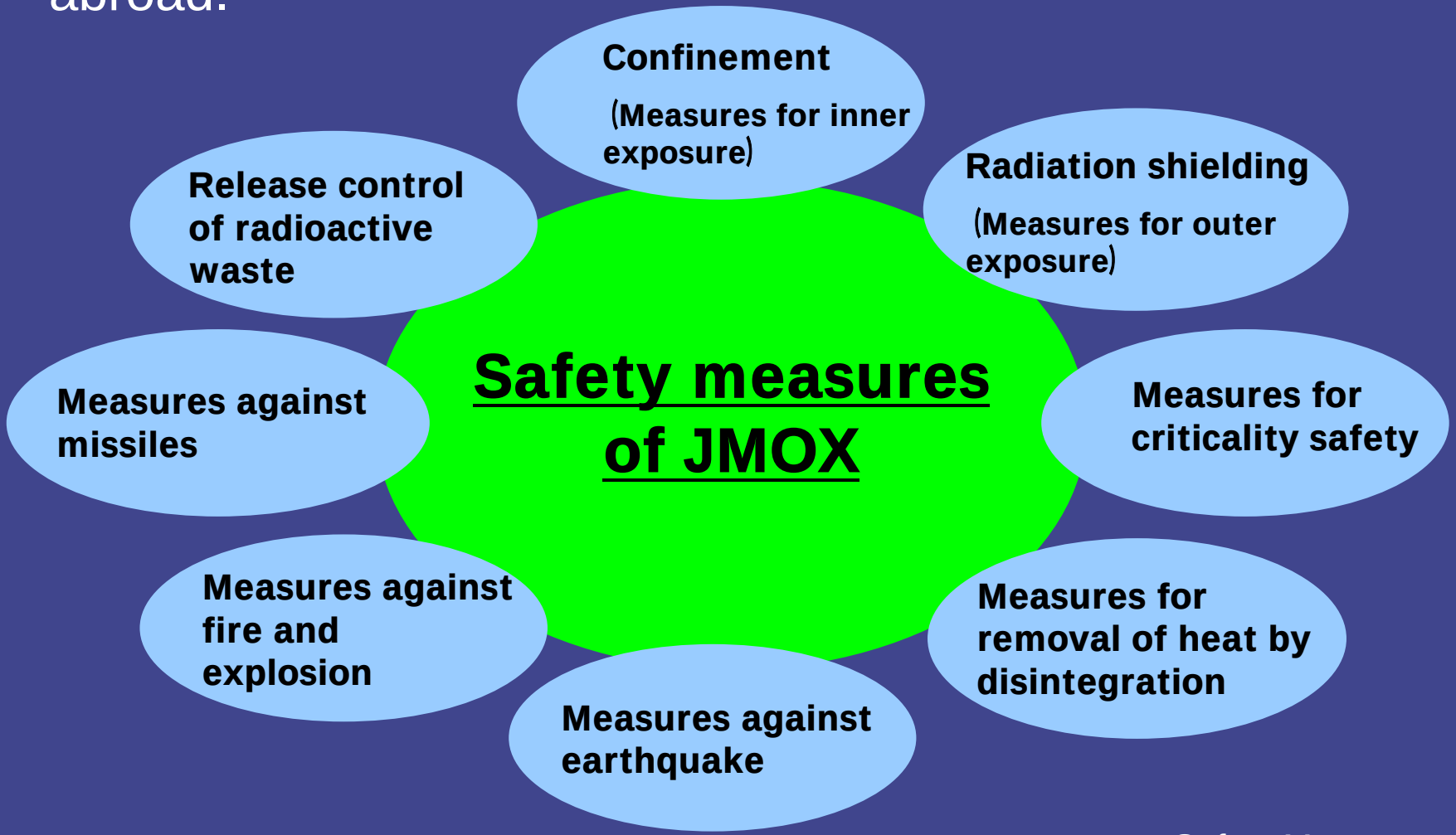


  - MIMAS (Micronized Master Blend)

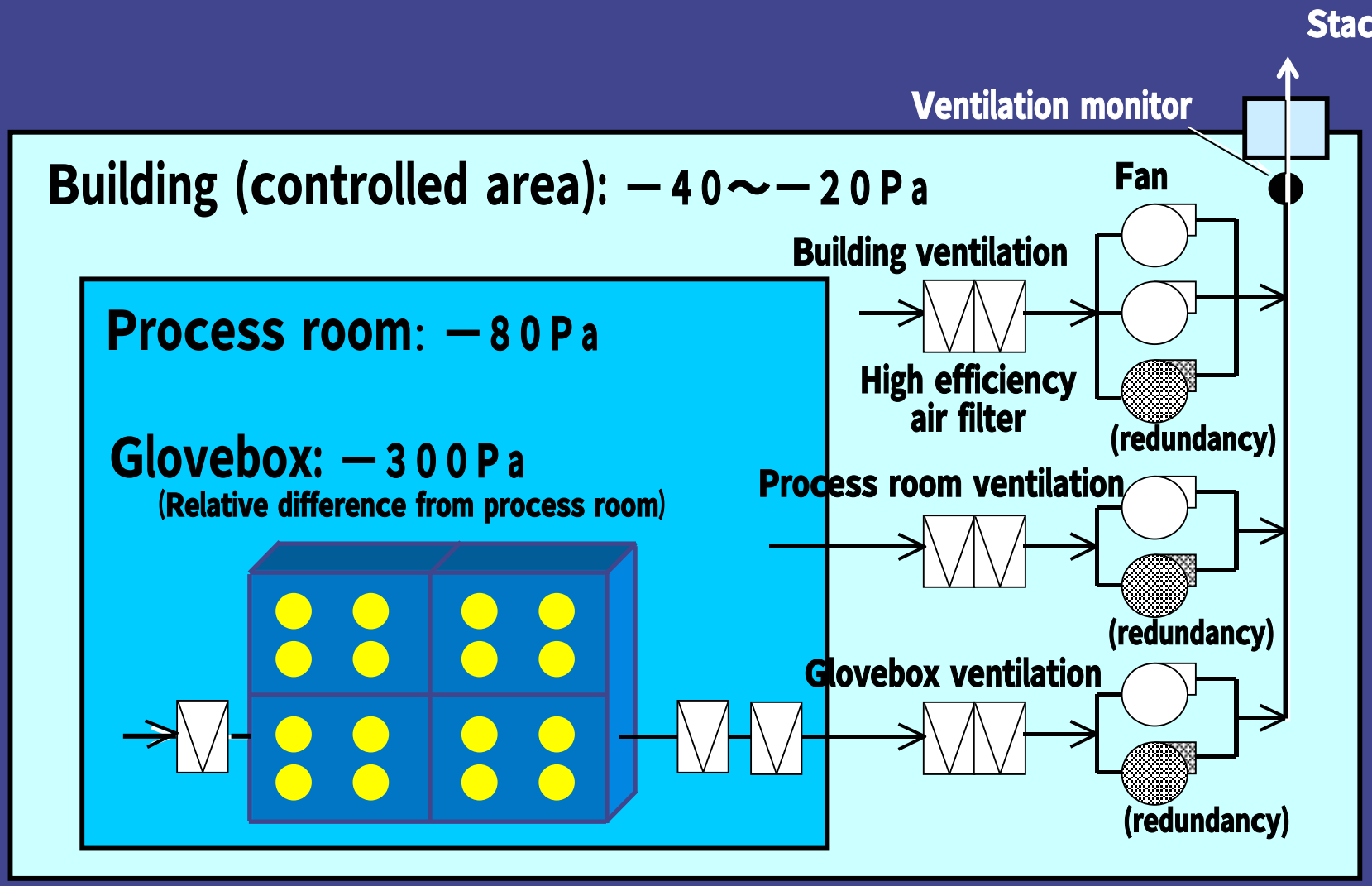
- Because feed powder to JMOX is Japanese typical MH-MOX, JNFL needs developing confirmation that MIMAS harmonizes with MH-MOX.

Safety Measures

- To proceed fully with safety measures considering MOX fuel characteristics and safety regulations domestic and abroad.

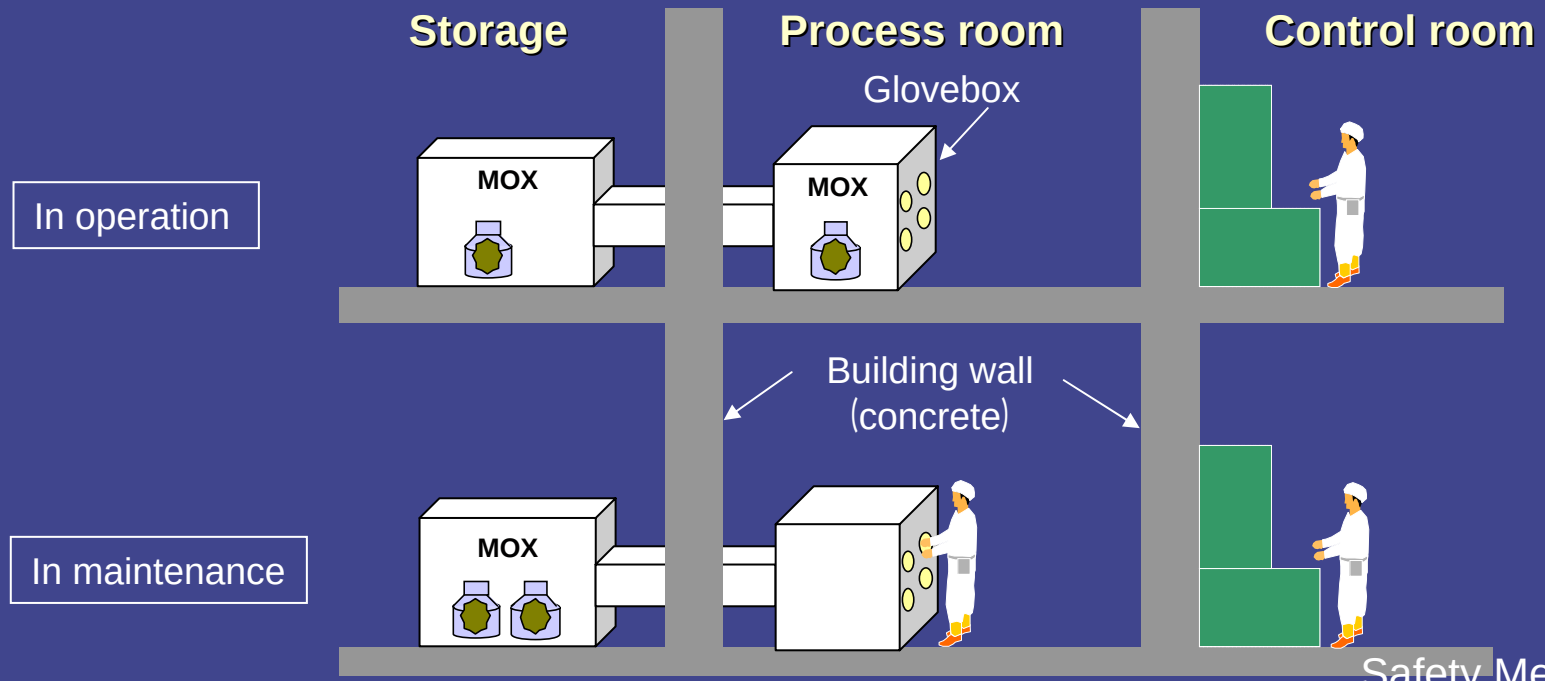


Confinement (to prevent contamination spreading by pressure control)



Radiation Shielding

- To prevent radiation to public:
  - To handle SNM in basement
  - Building wall effect to shield radiation
- To prevent radiation to operators:
  - Automated operation and/or remote operation
  - Shielding of equipment itself (Glovebox and machine)

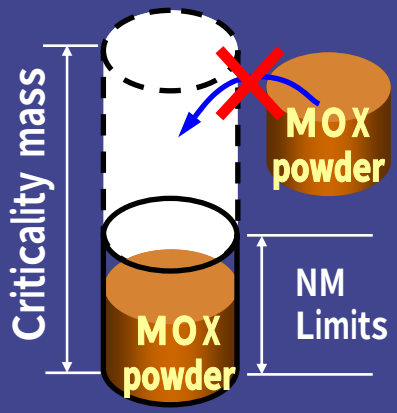


Philosophy of Criticality Safety Measures

Dry process

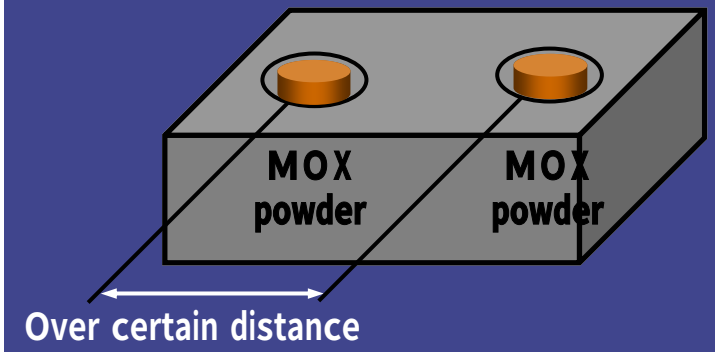
Not to put water to MOX powder nor make mixture of MOX powder and water in fabrication process.

Mass control



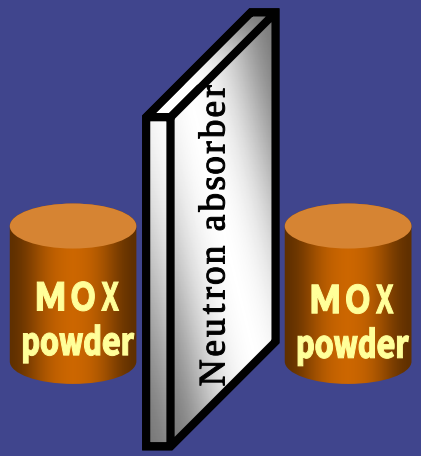
To handle with MOX powder less than Nuclear Material Limits that is far smaller than criticality mass.

Configuration control



To maintain certain distance between each of MOX powder.

Neutron absorption control

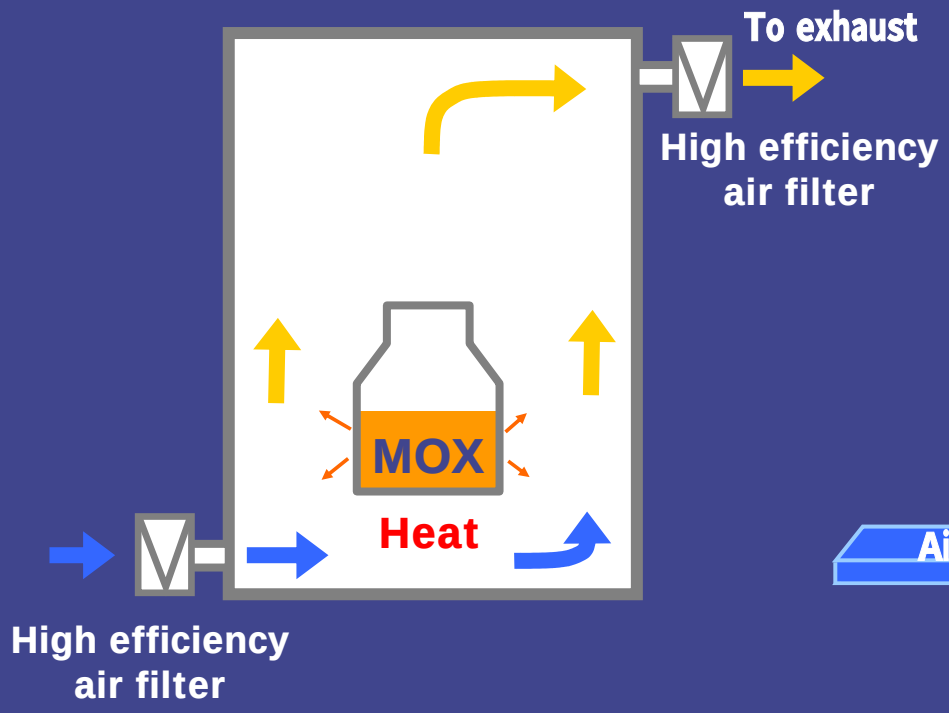


To use neutron absorber properly.

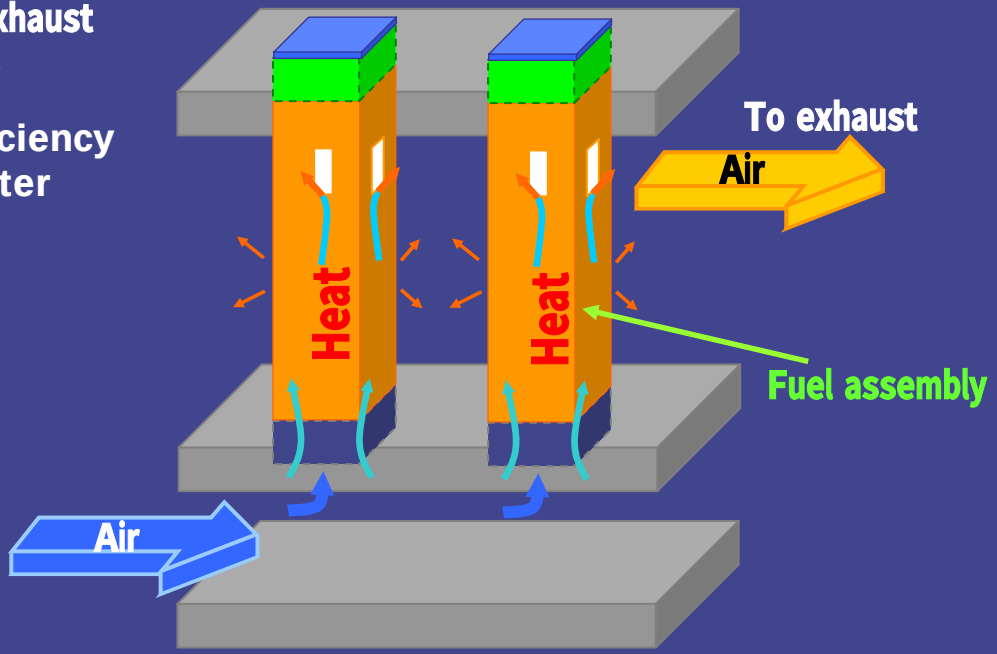
Heat Removal Measures

- Evacuating by ventilation system enough air necessary to remove heat generated by disintegration.

Glovebox



Fuel assemblies storage



Measures against Earthquake

- Putting enough strength to building and equipment in order to withstand an assumed earthquake scale.

Measures against Fire and Explosion

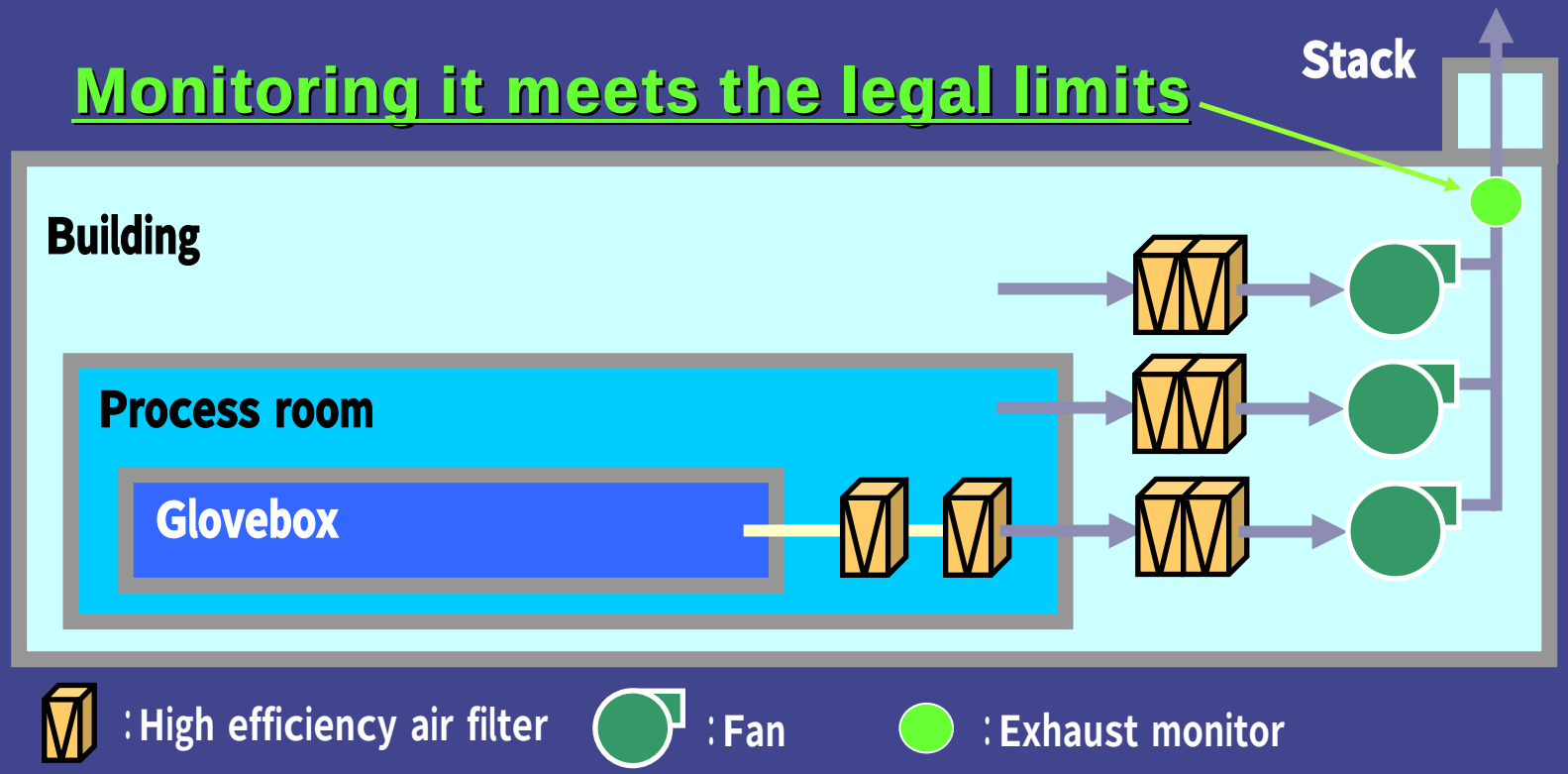
- Using nonflammable and fire-resistive material.
- Nitrogen atmosphere in main glovebox
- Glovebox to be equipped with fire detection, alarm and self fire-fighting system
- Building to be equipped with fire detection, alarm and fire-fighting system

Measures against Missiles

- Ensuring the outer wall of the building with enough strength against crash of airplane in maneuvers

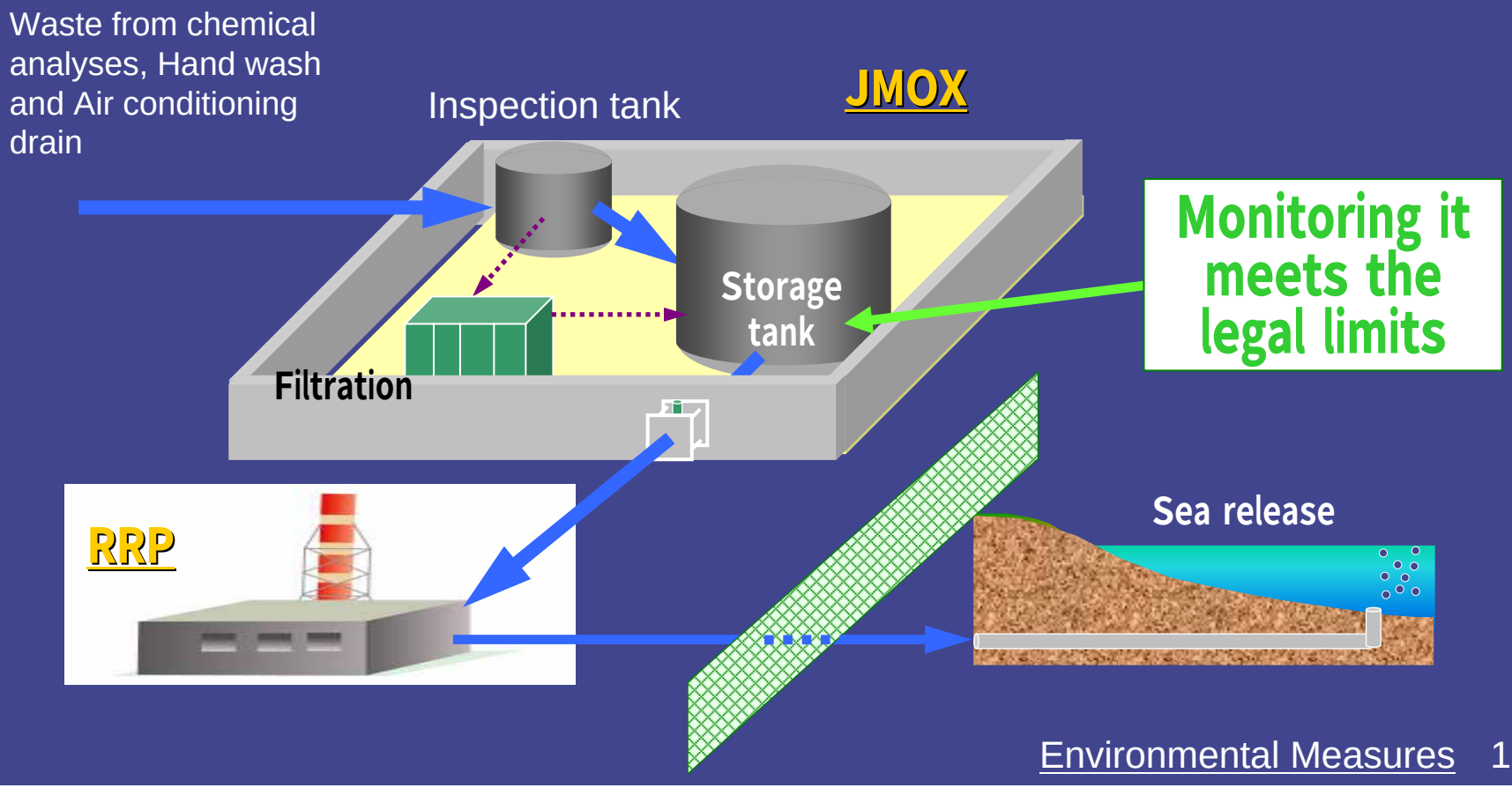
Release Control of Radioactive Gaseous Waste

- To filter the gaseous waste from the plant by high efficiency air filter and control releasing monitoring that the density of radioactive materials is under the legal limits.



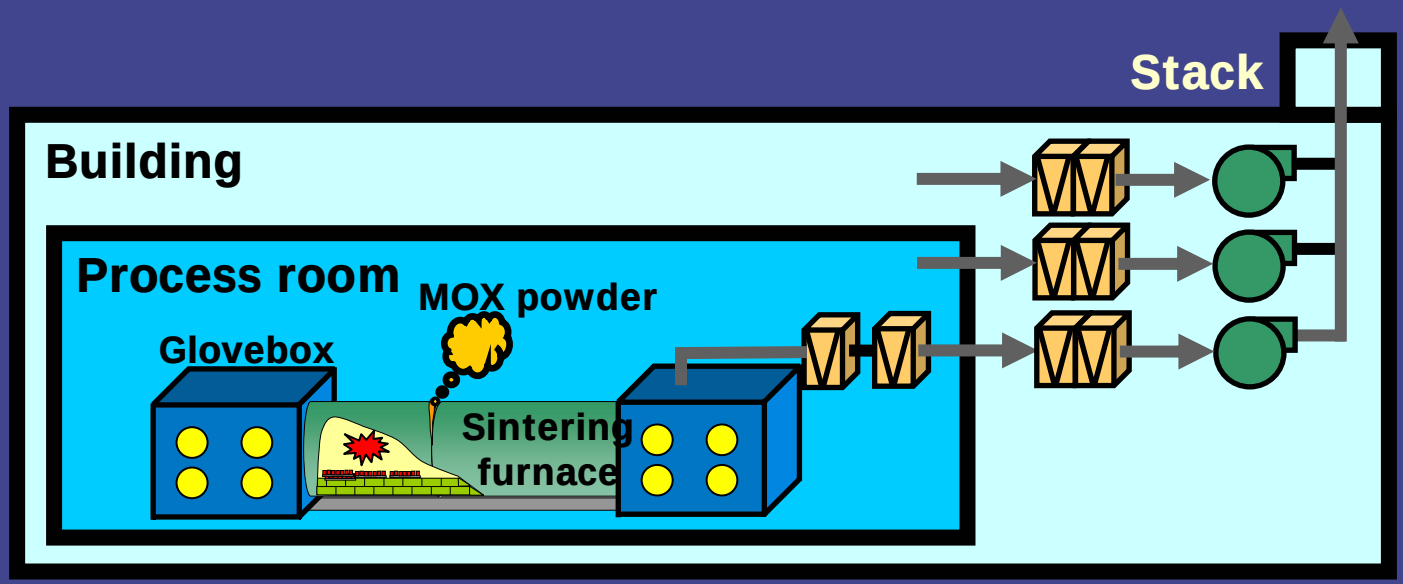
Release Control of Radioactive Liquid waste

- To filter the liquid waste from the plant by filtration system and control releasing monitoring that the density of radioactive materials is under the legal limits.



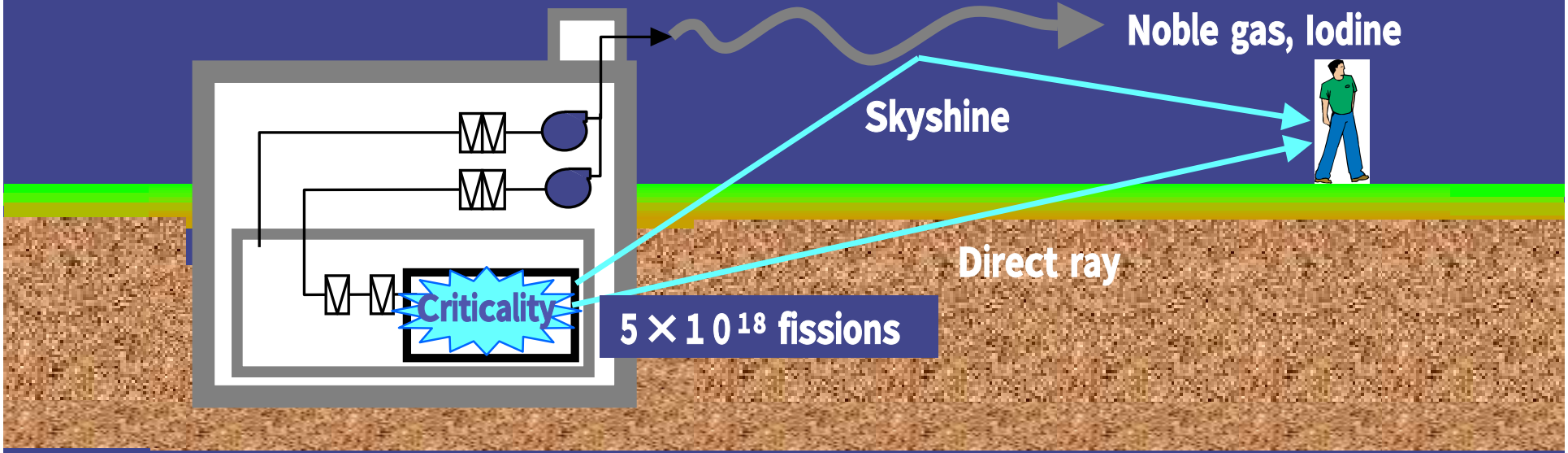
Impact on Environment by Accidents or Troubles

- In case that MOX powder spreads in process room by mal-operation, disorder/fire/explosion of equipment radiation dose to public can be lowered enough under 0.01mSv at maximum.



Case Study on Hypothetical Criticality Accident

- JNSC requests any MOX facilities to evaluate case study on hypothetical criticality accidents.
- Upon the requirement, an evaluation based that 5×10^{18} fissions had happened at equipment that treats with largest MOX powder shows radiation dose to public at the facility border is less than 5mSv.
- The evaluated dose lies far below 250mSv, standards shown in the JNSC guideline.



Outline of MOX Fuel Fabrication Plant

- Maximum throughput: 130t-HM/y
- Output: Fuel assembly to be shipped out to domestic nuclear power plants (both PWR and BWR)
- Scale of main building: 80mX80m, 3 basement floors, 2 stories, reinforced concrete
- JMOX siting plan: To become adjacent to RRP
- Investment: Approximately 1 b$
- Prospective operators: 300

Bird-eye view of JMOX

JMOX Outline

Construction Program

Year	2001～2004	2005	2006	2007	2008～2010	2011	2012
Main milestone		▲ Application Apr.2005		▲ Construction Apr.2007		▲ Hot test Apr.2011	▲ Completion Apr.2012
Siting offer							
Licensing ➢ Safety Assessment ➢ Approval on design and construction							
Construction							
Installation							
Work test							
Operation							