

**CONFIRMATION OF  
MAINTENANCE OF FUNCTION  
FOR TRANSPORT AFTER  
LONG-TERM STORAGE  
USING DRY METAL  
DUAL PURPOSE CASKS**

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# Introduction

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- **General strategy for the management of spent fuels in Japan:**  
**“to store spent fuels until being reprocessed”**
- **Japanese utilities are coping with safe storage of spent fuels and operation of a reprocessing plant.**
- **TEPCO operates 17 NPPs.**
  - **350tU of spent fuels produced every year**
  - Storage capacity: 6,370tU**
  - Storage amount: 5,010tU (as of Mar. 2010)**

# TEPCO's Decision for Further Storage

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**In order to increase the flexibility for coping with increasing amount of the spent fuels, TEPCO decided to construct an off-site interim spent fuel storage facility.**



**Establishment of RFS, Recyclable-Fuel Storage Company  
(a joint company with JAPC )**



**RFS will begin operation of the Japanese first off-site interim spent fuel storage facility at Mutsu in 2012.**

# Outline of Mutsu Facility

- **Final Storage Capacity : 5,000tU**
- **Storage Period : up to 50 years**
- **Construction Schedule :**
  - First building: 3,000 tU capacity**
    - ⇒ License for operation was permitted on 13/May/2010
    - ⇒ Construction began on 31/Aug./2010
  - Second building: 2,000tU capacity**
- **Cask Type: Dry metal dual-purpose cask**
- **Main Equipment & Devices:**
  - Equipment for carrying in, storing and carrying out fuels :
    - Metal Casks
    - Storage buildings
    - Metal cask handling equipment, etc.
  - No equipment for opening lids and surveying inside casks



# Outline of Mutsu Facility (2)

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## Role sharing :

### ➤ RFS

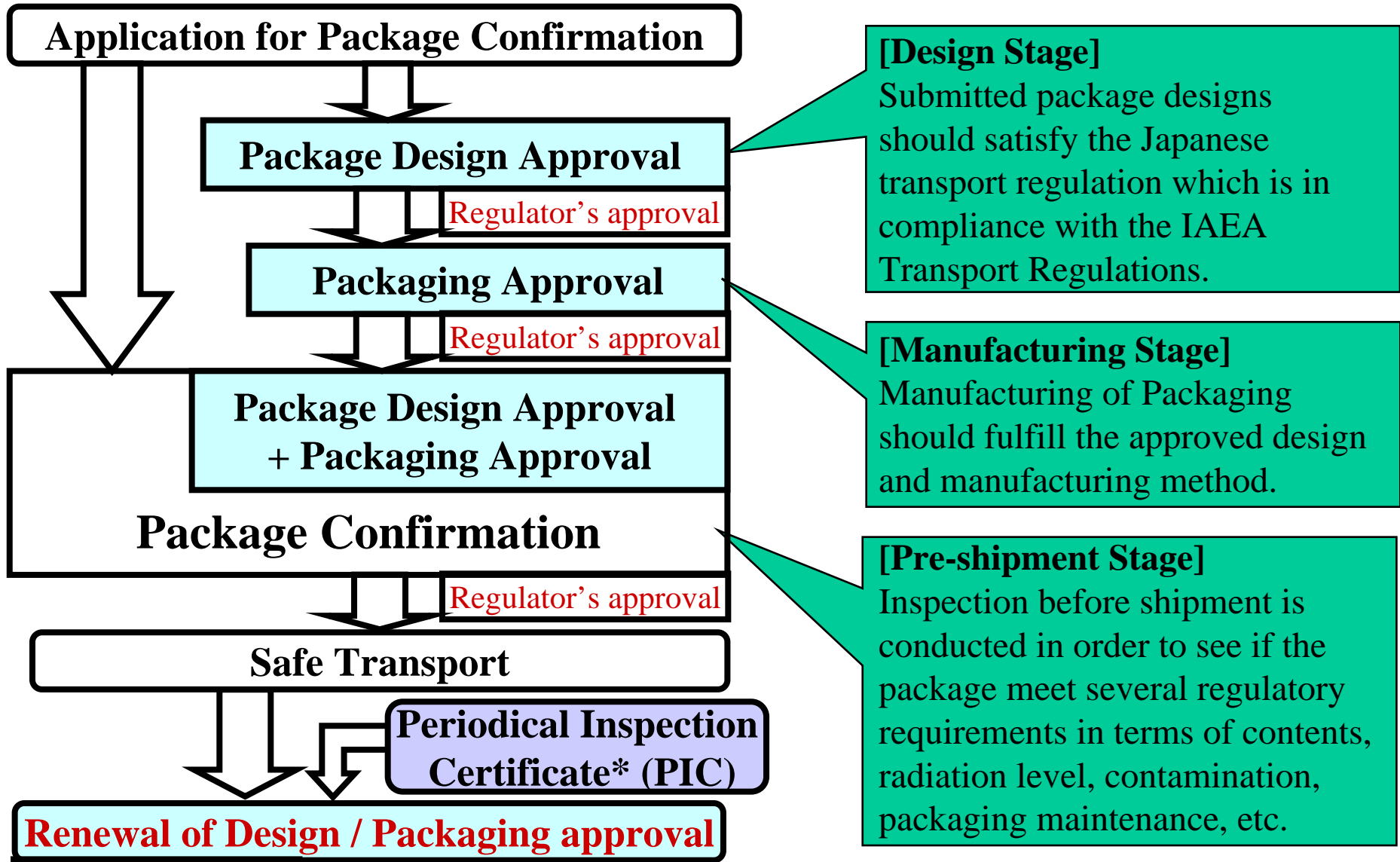
- ◆ Responsible for designing/building/operating Mutsu storage facility for up to 50 years

### ➤ TEPCO,JAPC

- ◆ Responsible for loading spent fuels in metal casks
- ◆ Responsible for transportation before / after storage
- ◆ Responsible for accumulation of data about a long-term storage of spent fuels under dry conditions

# Japanese Regulatory Framework

## (1) Transport packages



\*PIC is conducted every once a year on the licensees' responsibility

# Japanese Regulatory Framework

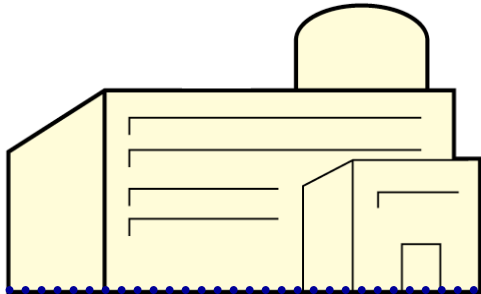
## (2) Dual-purpose casks

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- Main concept for the regulatory activities toward storage facilities using dual-purpose casks in Japan: **Holistic approach**
  - an approach which takes into account the interface issues arising between storage and transportation
  - Operators required to **maintain valid transport license throughout storage period** (Transport licenses should be **renewed every 5 years**)
  - Operators required for enough investigations when loading spent fuels and their records should be kept until the end of its post-storage transportation.
  - Data should be accumulated throughout storage period for certifying the integrity of both casks and inner spent fuels

# Overview of Storage and Transportation

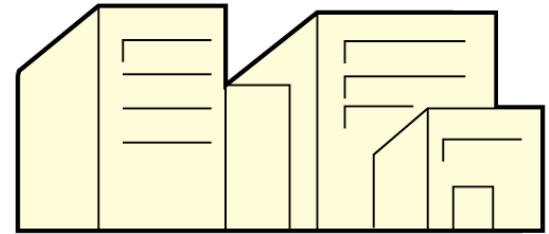
**Nuclear Power Plant**



**Loading of spent fuels  
into a cask**



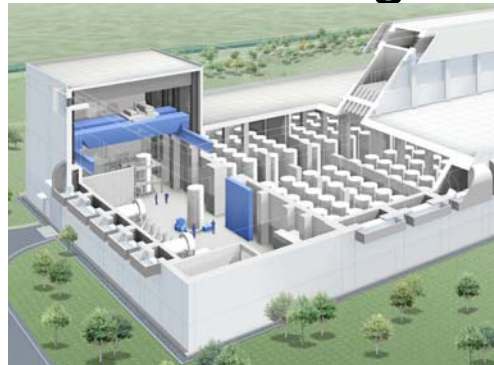
**Reprocessing Facility**



**Unloading of spent fuels  
from the cask**

**Interim Storage  
Facility**

**Storage period:  
up to 50 years**



**Same cask is used  
without opening its lid**

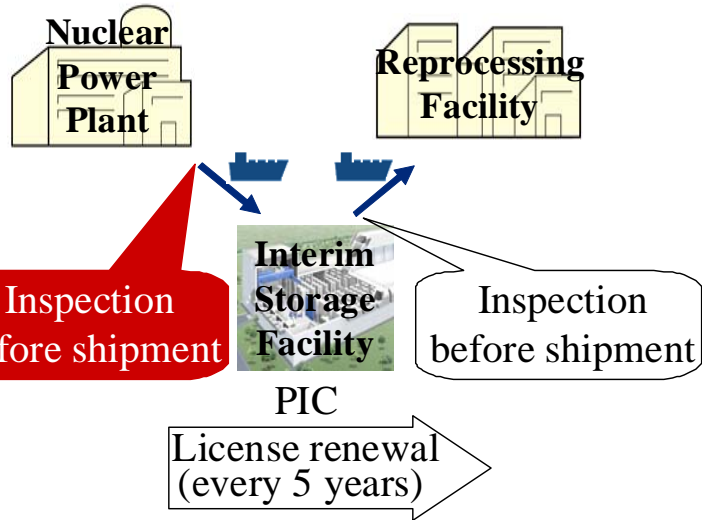
Inspection  
before shipment

License renewal  
of design/packaging approval  
(every 5 years)

Inspection  
before shipment



# Investigations for Pre-Storage Transportation



## Purpose

- ✓ To certify safety during transportation
- ✓ To certify compatibility for long-term storage

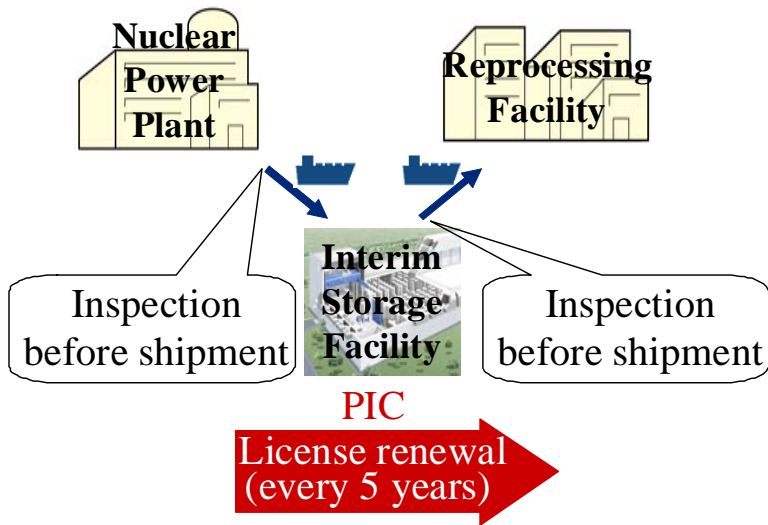
## Method

- ✓ 10 items inspected in the similar manner with inspections for transport-only purpose casks

## Inspection items

1. External appearance inspection
2. Leak tightness inspection
3. Pressure retaining inspection
4. Dose rate inspection
5. Subcriticality inspection
6. Temperature measurement inspection
7. Lifting inspection
8. Weight inspection
9. Content inspection
10. Surface contamination inspection

# Investigations during Storage Period(1)



## Purpose of inspections for storage casks

- ✓ To certify **safety during storage**  
→ Conducted by RFS

## Purpose of PICs

- ✓ To **renew** its design/packaging approval as a transport cask  
→ Conducted by TEPCO

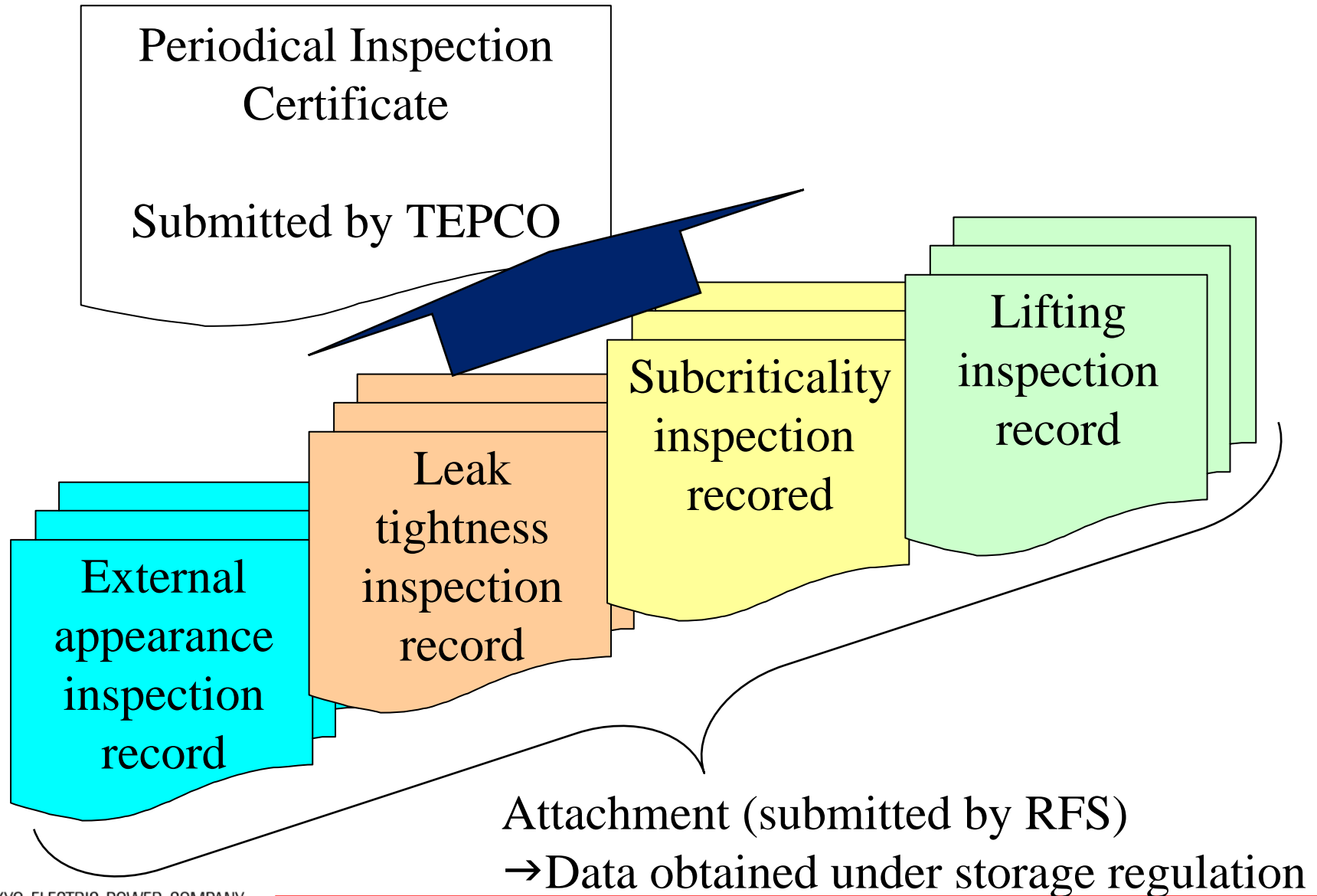
## Method

- ✓ PICs are conducted **every once a year**
- ✓ **Some data**, such as cask surface temperature and pressure between lids, is **continuously monitored** during storage period
- ✓ Inspections for storage casks are conducted every year

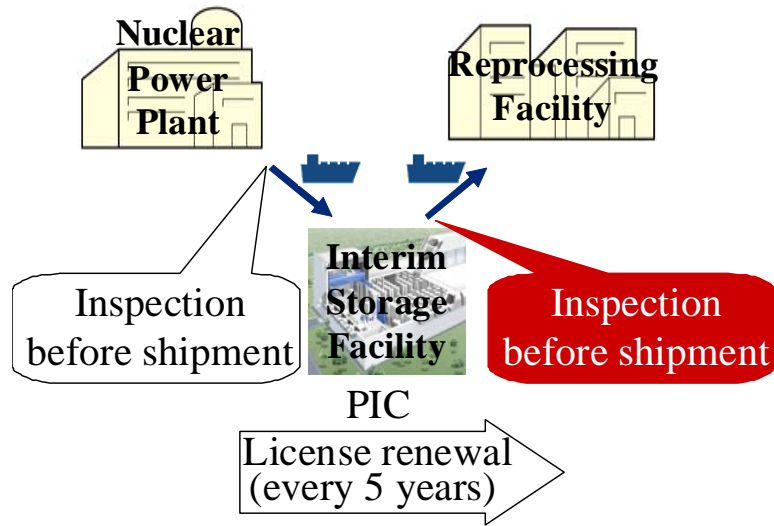
## Inspection items at PIC

1. External appearance inspection
2. Leak tightness inspection
3. Subcriticality inspection
4. Lifting inspection

# Investigations during Storage Period(2)



# Investigations for Post-Storage Transportation(1)



## Purpose

✓ To certify safety during transportation

## Method

✓ 10 items inspected using data obtained before / during storage period

**No necessity for opening lids of a cask**

## Inspection items

1. External appearance inspection
2. Leak tightness inspection
3. **Pressure retaining inspection**
4. Dose rate inspection
5. **Subcriticality inspection**
6. Temperature measurement inspection
7. Lifting inspection
8. Weight inspection
9. **Content inspection**
10. Surface contamination inspection

# Investigations for Post-Storage Transportation(2)

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## 3. Pressure retaining inspection

Pressure retaining inspection can be **replaced with records of fuel-loading procedure** and **pressure record charts** obtained **before** and **during** storage period

## 5. Subcriticality inspection

Visual inspection of fuel baskets for subcriticality check can be **replaced with the records of subcriticality inspection** conducted at the inspections before its **pre-storage** transportation and so on.

## 9. Content inspection

Visual inspection of spent fuels for a content inspection can be **replaced with the record of content inspection** conducted at the inspections for its **pre-storage** transportation and so on.

# Overall Relationship of various Inspections

[At nuclear power plant (NPS)]

Inspection before shipment (N)

1. External appearance inspection
2. Leak tightness inspection
3. Pressure retaining inspection
4. Dose rate inspection
5. Subcriticality inspection
6. Temperature measurement inspection
7. Lifting inspection
8. Weight inspection (Record: F)
9. Content inspection
10. Surface contamination inspection

[At Factory]

Inspection at the time of manufacture (F)

1. Material inspection
2. Size inspection
3. Weight inspection etc.

Pre-storage Transportation

License renewal of design/ packaging approval (every 5 years)

Periodical inspection certificate (PIC: once a year)

1. External appearance inspection
  2. Leak tightness inspection
  3. Subcriticality inspection
  4. Lifting inspection
- (Record: S)

Inspection at ISF (S)

1. External appearance inspection
2. Shielding inspection
3. Heat transfer inspection
4. Temperature measurement etc.

Continuous monitoring at ISF (S)

1. Pressure between primary /secondary lids
2. Cask surface temperature
3. Inlet and outlet air temperature
4. Area radiation in the building etc.

[At storage facility (ISF)]

Inspection before shipment

1. External appearance inspection
2. Leak tightness inspection
3. Pressure retaining inspection (Record: N,S)
4. Dose rate inspection
5. Subcriticality inspection (Record: N,S)
6. Temperature measurement inspection
7. Lifting inspection
8. Weight inspection (Record: F)
9. Content inspection(Record: N,S)
10. Surface contamination inspection

Post-storage Transportation

\*Bold typing expresses procedures and inspections required by transport regulations

# Conclusion

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- **To fulfill the safety standards required for a dual-purpose cask, quality assurance is very important throughout its storage period.**
- **RFS facility has no equipment for opening lids of the cask**
  - **It is very important to monitor and check the condition of casks by alternative measurements from outside the cask.**
- **A pile of records will be used as an evidence for licensing renewal procedures as transport casks. It is also used as a part of records necessary to be attached as an inspection data before shipment for post-storage transportation.**
  - **Maintenance of records for several decades is essential.**
- **In addition, accumulation of enough knowledge about long-term storage of spent fuels under dry condition is very important.**
  - **If any new findings on unpredictable deterioration were obtained from such activities, the safety of the casks and SFs should be carefully investigated.**