

China's Experience with Life-cycle Management of Sealed Radioactive Sources

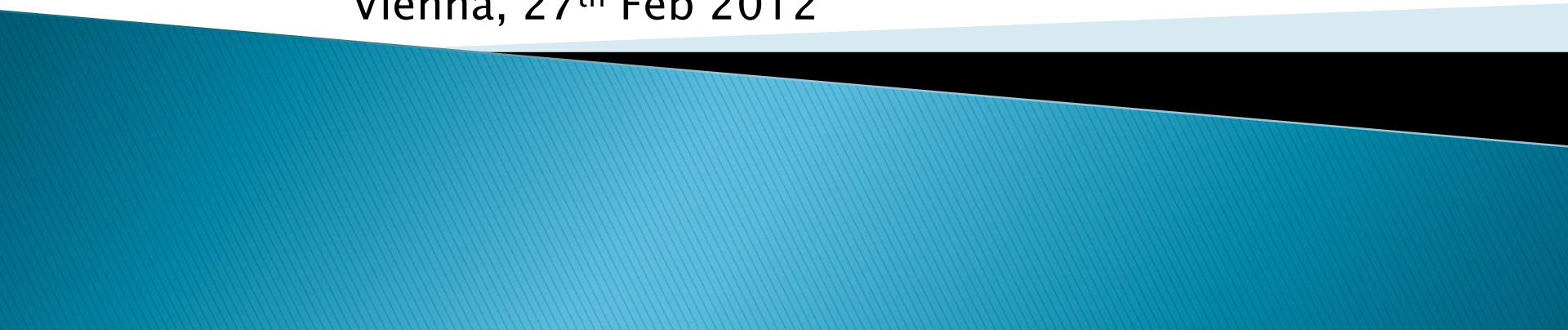
Zhiping Luo

Dept. of Radiation Safety,
China Institute of Atomic Energy, China

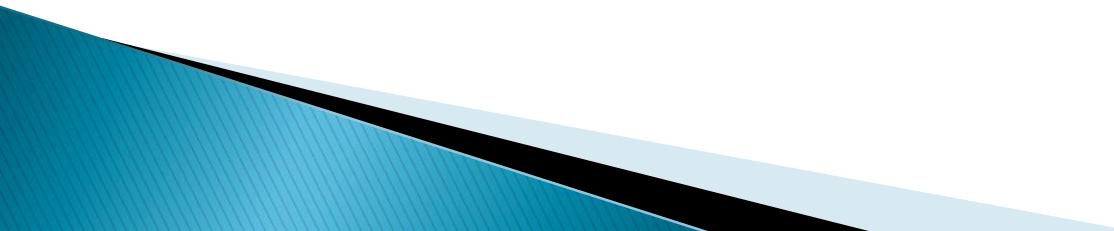
Yigang Liu

National Nuclear Safety Administration,
Ministry of Environmental Protection, China

Vienna, 27th Feb 2012



Contents

1. Legislation/Regulation in China
 2. Regulatory of SRS in China
 - Competent Authority
 - Licensing Management
 - Routing Supervision and Administration
 3. Life-cycle Management of SRS
 - Categories and Identification of SRS
 - Manufacture/Import of SRS
 - Management of SRS
 - Transfer or Shifting of SRS
 - Disused SRS
- 

1. Legislation/Regulation in China

Regulations on Safety and Protection of
Radioisotopes and Radiation-emitting Devices
(Decree No. 449 of the State Council, Adopted 2005)

```
graph TD; A[Regulations on Safety and Protection of Radioisotopes and Radiation-emitting Devices  
(Decree No. 449 of the State Council, Adopted 2005)] --> B[Code of Conduct on Licensing for the Safety of Radioisotopes and Radiation-emitting Devices  
(Decree No. 31 of the SEPA, 2006)]; A --> C[Code of Conduct on Safety and Protection of Radioisotopes and Radiation-emitting Devices  
(Decree No. 18 of the MEP, 2011)];
```

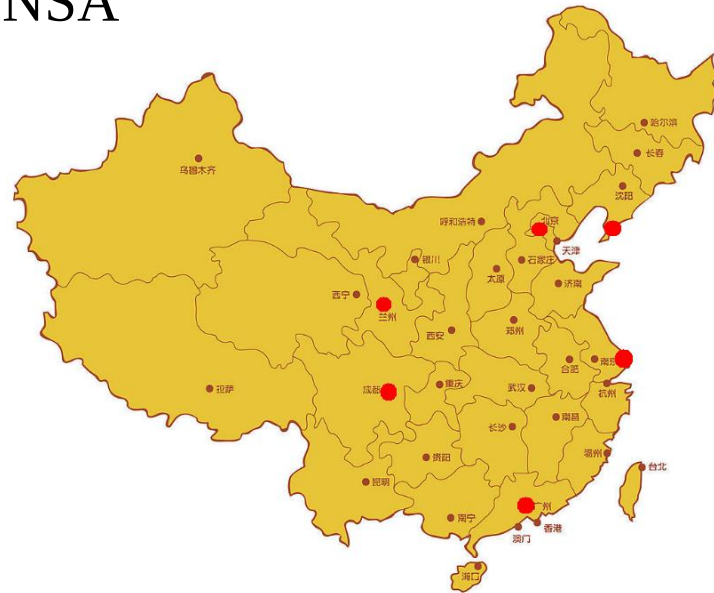
Code of Conduct on Licensing for the
Safety of Radioisotopes and Radiation-
emitting Devices
(Decree No. 31 of the SEPA, 2006)

Code of Conduct on Safety and
Protection of Radioisotopes and
Radiation-emitting Devices
(Decree No. 18 of the MEP, 2011)

2. Regulatory of SRS in China

– Competent Authority

- ▶ The National Nuclear Safety Administration (NNSA) of MEP
- ▶ 6 Supervision Offices under NNSA
 - North China Office
 - East China Office
 - Northeast Office
 - Southwest Office
 - Northwest Office
 - South China Office



(Decree No.449- Article 3:

The competent environmental protection department of the State Council shall implement unified supervision over and administration of the safety and protection of radioisotopes and radiation-emitting devices nationwide.)

2. Regulatory of SRS in China

– Licensing Management

- ▶ Implement licensing management on the manufacture, sale and usage of Radioactive Sources. (Decree No. 31 of the SEPA, 2006)
- ▶ License issued by authorities at 2 levels:
 - State Level: Category I
 - Provincial Level: Category II - V

2. Regulatory of SRS in China

– Routine Supervision & Administration

- ▶ Routine supervision and administration conducted by authorities at 4 levels:
 - State Level: Category I facility;
 - Provincial Level: Category II - V facility;
 - City Level: Assist in supervising facilities in the city area;
 - Prefectural Level: Assist in supervising facilities in the prefectural area.

3. Life-cycle Management of SRS

– Categories and Identification of SRS

- ▶ Categorized on the basis of the potential hazards that may cause to human health and the environment.
- ▶ Radioactive sources are classified as :
 - Category I, II, III, IV, V
(with Category I as the most hazardous, Category V as the least hazardous)

3. Life-cycle Management of SRS

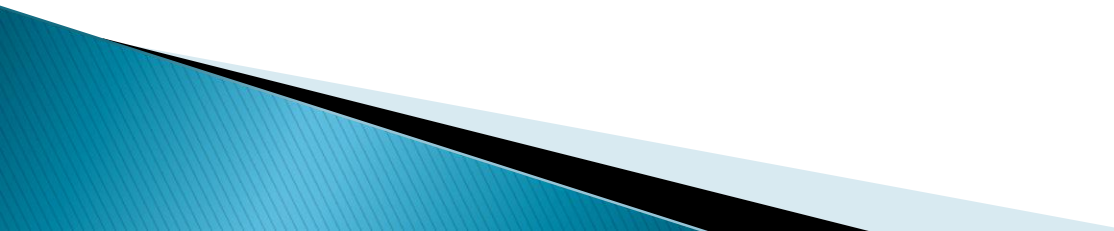
– Categories and Identification of SRS

核素名称	I 类源 (贝可)	II 类源 (贝可)	III 类源 (贝可)	IV 类源 (贝可)	V 类源 (贝可)
Am-241	$\geq 6 \times 10^{13}$	$\geq 6 \times 10^{11}$	$\geq 6 \times 10^{10}$	$\geq 6 \times 10^8$	$\geq 1 \times 10^4$
Am-241/Be	$\geq 6 \times 10^{13}$	$\geq 6 \times 10^{11}$	$\geq 6 \times 10^{10}$	$\geq 6 \times 10^8$	$\geq 1 \times 10^4$
Au-198	$\geq 2 \times 10^{14}$	$\geq 2 \times 10^{12}$	$\geq 2 \times 10^{11}$	$\geq 2 \times 10^9$	$\geq 1 \times 10^6$
Ba-133	$\geq 2 \times 10^{14}$	$\geq 2 \times 10^{12}$	$\geq 2 \times 10^{11}$	$\geq 2 \times 10^9$	$\geq 1 \times 10^6$
C-14	$\geq 5 \times 10^{16}$	$\geq 5 \times 10^{14}$	$\geq 5 \times 10^{13}$	$\geq 5 \times 10^{11}$	$\geq 1 \times 10^7$
Cd-109	$\geq 2 \times 10^{16}$	$\geq 2 \times 10^{14}$	$\geq 2 \times 10^{13}$	$\geq 2 \times 10^{11}$	$\geq 1 \times 10^6$
Ce-141	$\geq 1 \times 10^{15}$	$\geq 1 \times 10^{13}$	$\geq 1 \times 10^{12}$	$\geq 1 \times 10^{10}$	$\geq 1 \times 10^7$

(Reference: RS-G-1.9 (IAEA Safety Guide))

3. Life-cycle Management of SRS

– Categories and Identification of SRS

- ▶ Manufacturer shall establish inventory of radioisotope products and, indentify the RS with the coding rules formulated by competent authority.
 - ▶ The inventory of radioisotope products, and the list of identification numbers of RS shall be submitted to competent authority for recordance.
- 

3. Life-cycle Management of SRS

– Categories and Identification of SRS

放射源编码格式											
1	2	3	4	5	6	7	8	9	10	11	12

Coding consists of information including:

- (1) Producer
- (2) Date of production
- (3) Code of radionuclide
- (4) Serial No.
- (5) Category of RS

核素名称											
出厂活度	贝可										
出厂日期	年 月 日										
生产厂家											
源外形尺寸											
标号											
国家编码											



Coding Card

3. Life-cycle Management of SRS

– **Manufacture/Import of SRS**

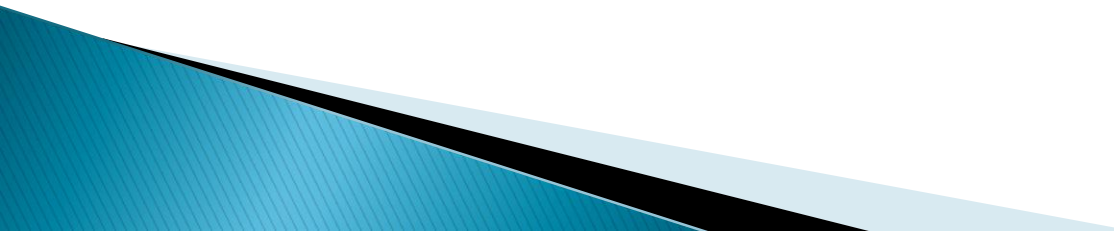
- ▶ Approved under licensing system
- ▶ The one who produce or import radioactive sources of Category I/II/III shall sign a agreement on returning the disused sources with the users of RS.
- ▶ Radioactive sources of Category IV/V can be returned or stored in the interim storage facility in China.

3. Life-cycle Management of SRS

– Management of SRS

- Conspicuous radiation caution symbols shall be placed in the sites for producing, selling, usage or storage, in accordance with the relevant provisions.
- Safety and protection equipment, necessary safe interlock, alarm devices and working signals shall be installed at entrances, in accordance with the requirements of relevant national standard.

3. Life-cycle Management of SRS

- **Management of SRS**
 - Registration and inspection shall be conducted when radioisotopes are stored, received, used or returned, to ensure the coincidence between the recordance and the reality.
 - Safety measures against fire, water, theft, loss, destruction and radiation leaks shall be conducted on site.
 - Inventory should be verified termly during usage, avoiding loss of RS.
- 

3. Life-cycle Management of SRS

– Transfer

- ▶ Transfer of radioactive sources shall be approved by the provincial authority. The agreement on returning the disused sources of Category I/II/III shall be signed between two sides.
- ▶ While imported RS is transferred, the certification document from the manufacturer for reclaiming the DSRS of Category I/II/III shall be copied to the receiver.

– Shifting

- ▶ Usage of RS in an altered location shall be recorded by the provincial authority.

3. Life-cycle Management of SRS

– Disused SRS

- The DSRS is encouraged to be reused by other facilities.
- The one who use the RS of category I/II/III shall return the disused RS to the manufacturer or repatriate to the original country, under the returning agreement, in 3 months since the RS was disused.

3. Life-cycle Management of SRS

– Disused SRS

- DSRS which is finally unable to return or repatriate, shall be delivered to qualified facility for interim storage. Maintenance fee is charged.
 - The interim storage facility for DSRS, shall get the license for the safe usage (including storage) of RS issued by competent authority, and store the DSRS within corresponding authorization..
 - No. of the interim storage facility in China under operation: 32 (31+1) .

Thank you for your attention.

