

Assessment of the Radiological Safety of Exposure Devices For Industrial Gamma Radiography in Argentina

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1. Introduction

- Industrial gamma radiography is an extended technique used as a non-destructive assay method in Argentina.
- This activity is considered of a significant radiological risk, as it has been demonstrated by the magnitude and frequency of the radiological accidents occurred worldwide.
- The IAEA Specific Safety Guide "Radiation Safety in Industrial Radiography" makes reference to the compliance with the requirements of ISO 3999:2004(E) Standard "Radiation Protection- Apparatus for industrial gamma radiography- Specifications for performance, design and test".
- There are some types of equipment not yet complying with ISO 3999.

2. Objectives

- Present the results of the safety assessment which could lead to the decision of the Nuclear Regulatory Authority of withdrawing from the use an important part of the inventory of gamma radiography equipment.

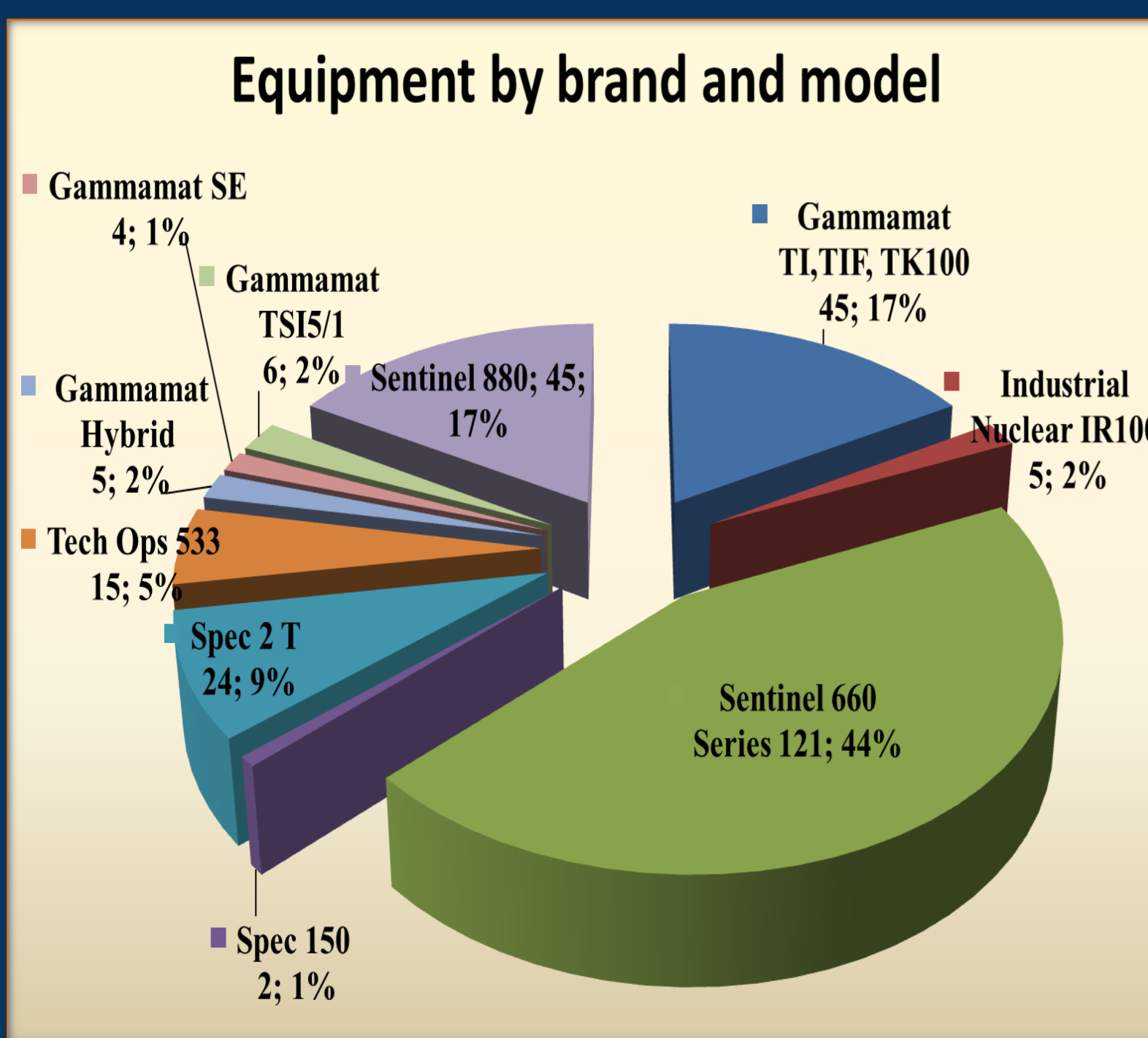
3. Methods

The data assessed was collected from the 68 facilities performing industrial gamma radiography activities in Argentina with portable exposure containers classified as Category II.

The main elements of the evaluation can be summarized as follows:

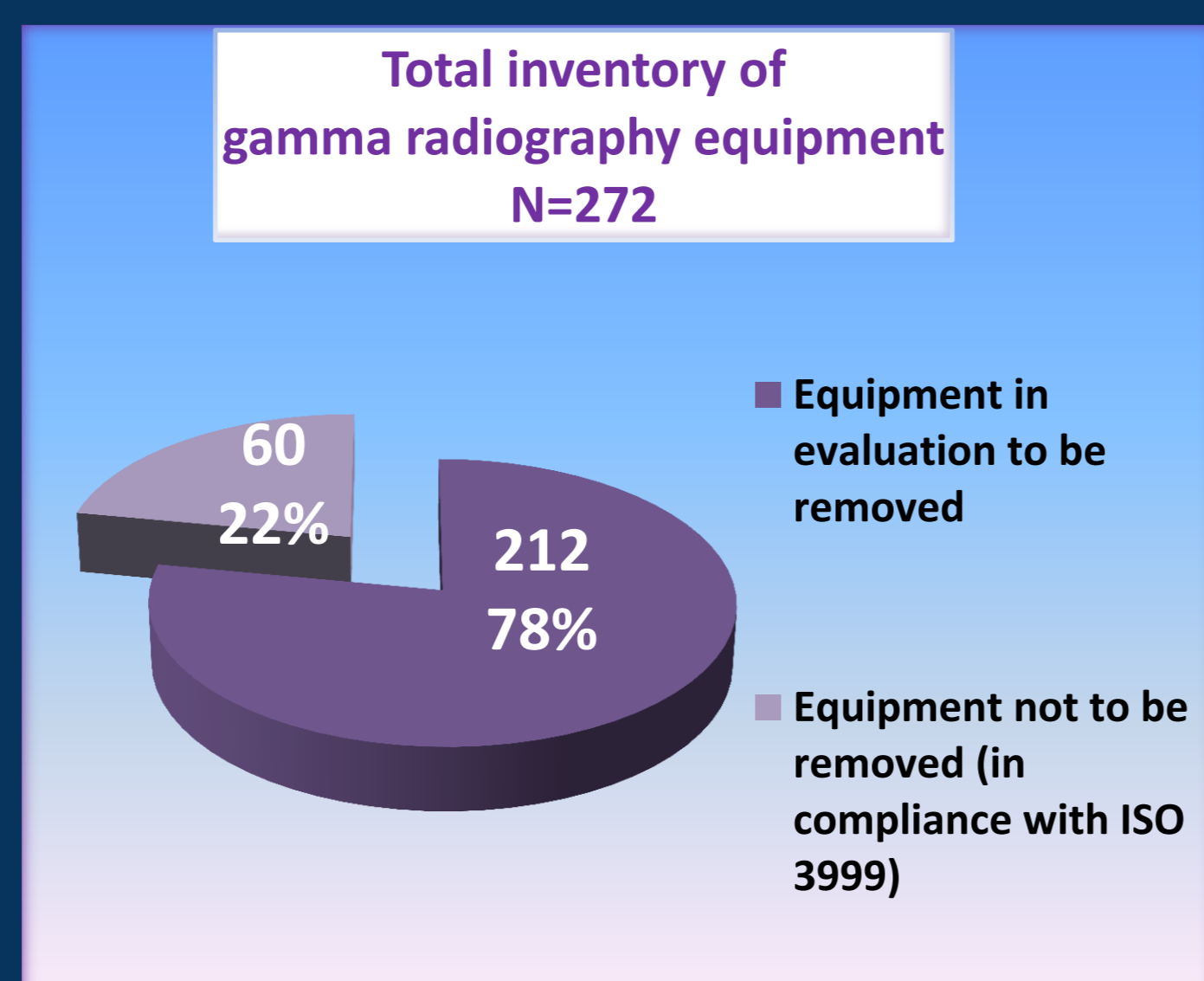
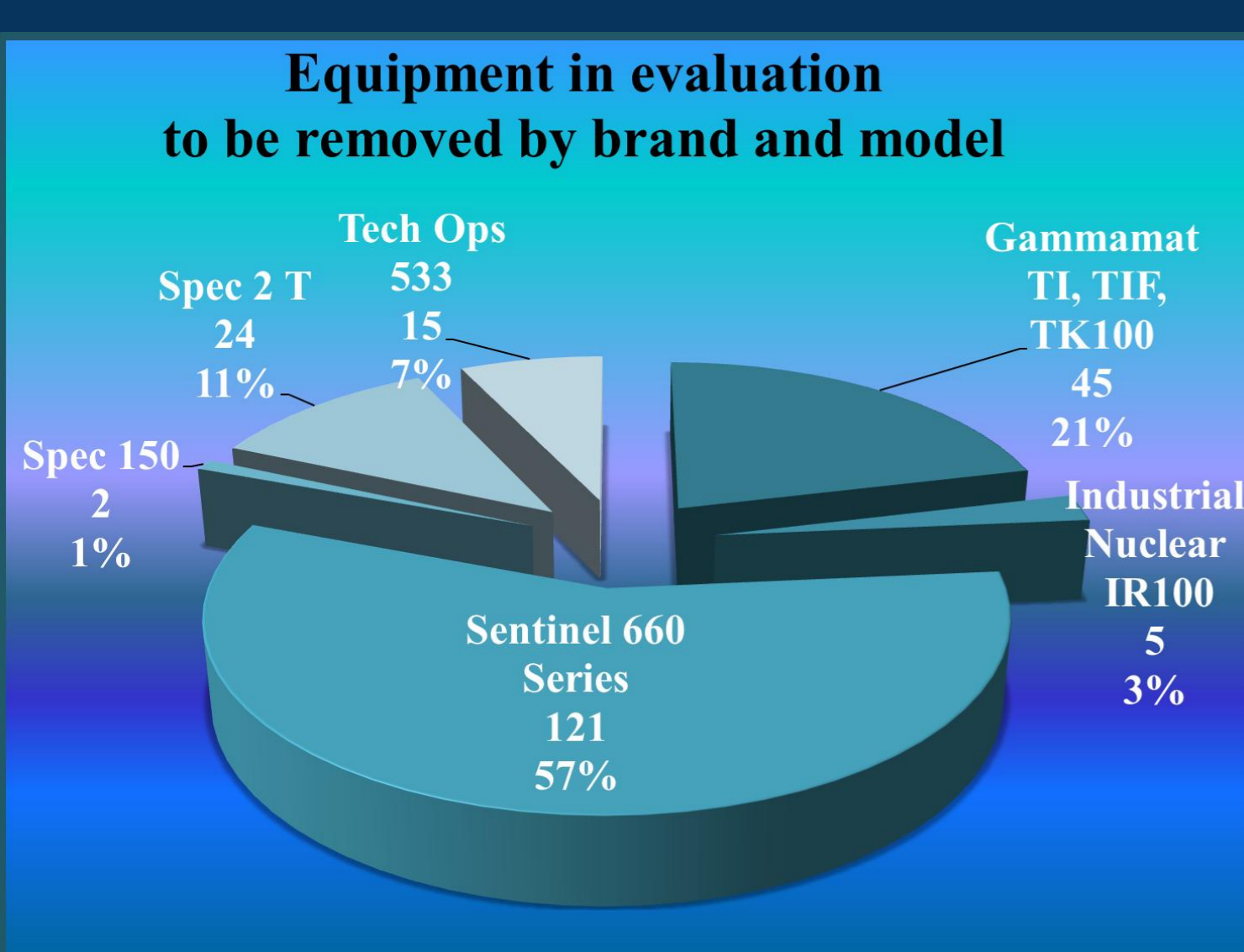
- decision of some manufacturers to discontinue the production of certain equipment models and the provision of their spare parts;
- failures in the compliance of the apparatus with the international recommendations;
- comparison between the requirements of the AR 7.9.1 Standard and the ISO 3999 Standard;
- validity of type B(U) package certificates for their transport.
- alternatives for the management of depleted uranium shielding of exposure containers.

4. Results



AR 7.9.1 Standard establishes the preventive maintenance and routine control of all the elements related to the industrial gamma radiography activity and that each exposure device should be checked on a yearly basis by an independent institution certified by ARN, in order to ensure that it remains in safe operating conditions.

Equipment	Gammamat Hybrid	Gammamat SE	Gammamat (TI; TI-F; TK100)	Gammamat TSI 5/1	Industrial Nuclear IR100	Sentinel 660 series	Sentinel 880	Spec 150	Spec 2T	Tech Ops 533
Compliance with 3999 ISO Standard	Yes	Yes	No	Yes	No	No	Yes	No	No	No



The alternatives assessed for the equipment to be withdrawn are:

- final disposal or recycling of the depleted uranium shielding;
- use as containers of radioactive sources.

Equipment	Compliance with Requirements of Argentine legislation (AR 7.9.1 Standard)	Additional requirements of ISO 3999			
		Source position indicators clearly visible at 5 m	Ambient equivalent dose rate on external surface (< 2 mSv/h) with maximum activity allowed	Automatic securing mechanism	Three needed connections
Gammamat Hybrid	Yes	Yes	Yes	Yes	Yes
Gammamat SE	Yes	Yes	Yes	Yes	Yes
Gammamat (TI; TI-F; TK100)	Yes	No	Yes	No	No
Gammamat TSI 5/1	Yes	Yes	Yes	Yes	Yes
Industrial Nuclear IR100	Yes	Yes	No (new version: Yes)	Yes	No
Tech Ops 660	Yes	No	Yes	No	No
Sentinel 660 B	Yes	Yes	Yes	Yes	No
Sentinel 880	Yes	Yes	Yes	Yes	Yes
Spec 150	Yes	No	Yes	Yes	No
Spec 2T	Yes	No	No	No	No
Tech Ops 533	Yes (with restricted source activity)	No	No	No	No

Equipment	Gammamat Hybrid	Gammamat SE	Gammamat (TI; TI-F; TK100)	Gammamat TSI 5/1	Industrial Nuclear IR100	Sentinel 660 series	Sentinel 880	Spec 150	Spec 2T	Tech Ops 533
Type B(U) certificate	RUS/5688/B(U)-96T	RUS/5373/B(U)-96	D/2011/B(U)-85; D/2012/B(U)-85; D/2016/B(U)-85;	CDN/2086/B(U)-96	USA/9157/B(U)-96	USA/9283/B(U)-96	USA/9296/B(U)-96	USA/9263/B(U)-96	USA/9056/B(U)-85	---
Validity until:	April 25, 2014	May 25, 2014	December 31, 2012	March 31, 2014	October 31, 2014	June 30, 2013	June 30, 2016	June 30, 2015	April 15, 2015	---

5. Conclusions

- It is highlighted the need of a regulatory decision complementary to the AR 7.9.1 Standard concerning the operation of industrial gamma radiography equipment, in line with the current international recommendations and the commitment of Argentina to the good practices and safety culture.
- The Nuclear Regulatory Authority of Argentina is currently considering the potential benefit of the withdrawal of a significant part of the inventory of equipment used in industrial gamma radiography in the country, taking into account the compliance with the requirements of ISO 3999:2004(E) Standard as well as the validity of the authorization certificates for package models.