

**Overview of the
U.S. Nuclear Regulatory Commission's
Initiatives on the Use of Cesium-137 Chloride Sources**

November 8, 2010
Public Meeting on the
Draft Policy Statement on Cesium 137 Chloride Sources

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What is a Cesium-137 Source?

- Definition of Source: radioactive material in a closed capsule to be used for a technological purpose
- Cesium-137 Source: contains the radioactive isotope Cs-137
- Cs-137 is emitter of gamma radiation – feature utilized in irradiators
- Use of Cesium-137 Chloride (CsCl)
 - Ideal energy spectrum (670 keV)
 - Long half life (30 years)
 - Readily available

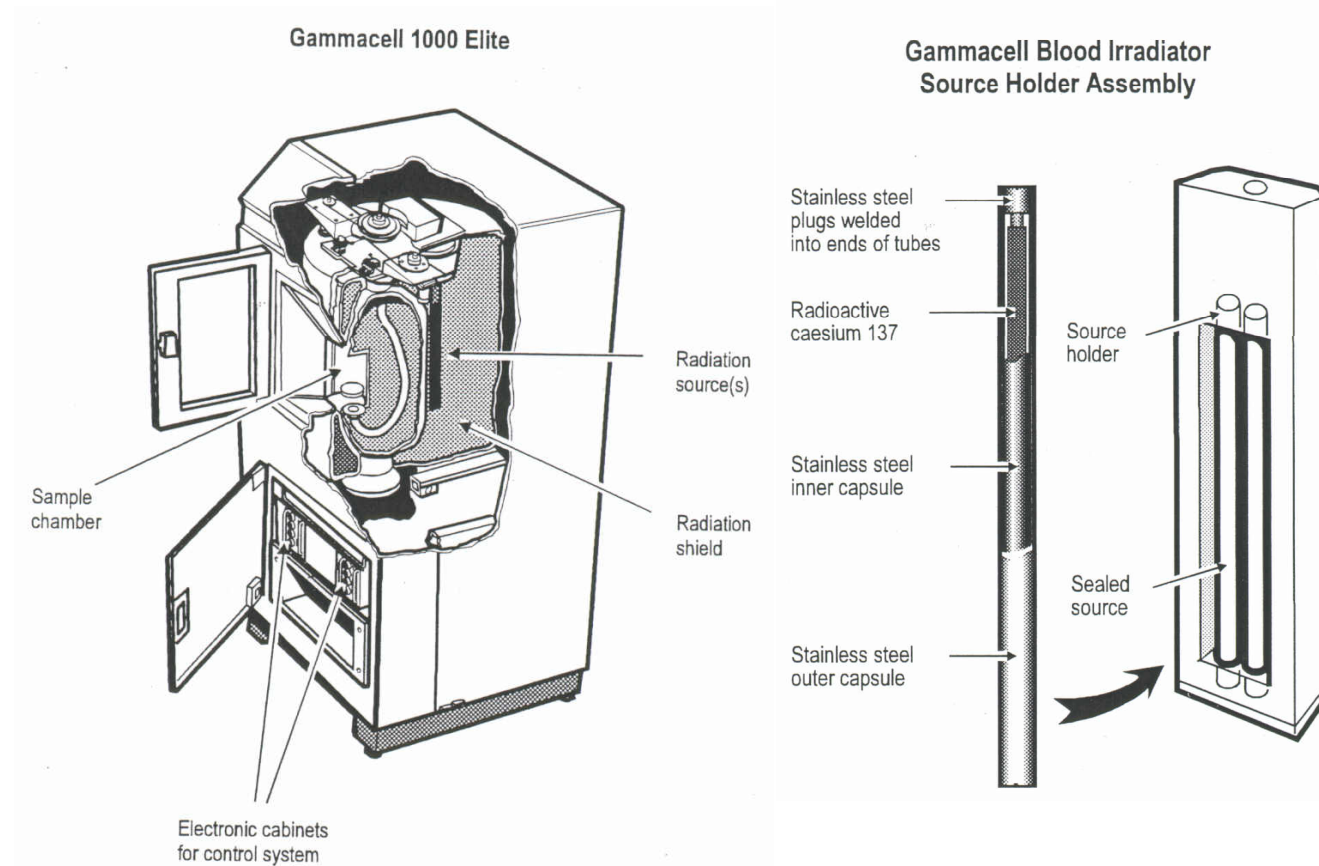
Properties of CsCl

- Used in a chemical form of cesium chloride (CsCl)
 - Similar to table salt (i.e. sodium chloride)
 - Soluble in water
- Used in a physical form of compressed powder
 - Similar in consistency to tic-tac candy
 - When pulverized, powder spreads as an aerosol
- mechanical configuration
 - Compressed powder pellets double-encapsulated in stainless steel capsules
 - Both welded shut

Areas of Usage

- Low activity usage (in millicurie quantities):
 - Moisture density gauges for road and foundation construction
 - Leveling gauges in chemical tanks
 - Well-logging devices for oil exploration
 - Brachytherapy sources in radiation medicine
- High activity usage (in 100's and 1,000's curie quantities):
 - Blood irradiators for blood irradiation
 - Biomedical research for cancer, immunology, drugs, DNA, genetics
 - Calibration of instruments measuring radiation and personal exposure rates

Typical Blood Irradiator



Gammacell 40 irradiator



Outside view of Blood irradiator



Loading of Irradiator



J.L. Shepherd - Category 1 Irradiator



Instrument Calibrator



Hopewell Designs, Inc. calibrator



Use of Irradiators in the U.S.

Application	IAEA Category	# of Licensees	# of Devices	% of Total Curies
Blood Irradiators	1-2	327	575	33.65
Research Irradiators	1-2	265	526	66.00
Calibrators	2	61	104	0.35

Current Status

- CsCl radiation sources perform critical functions
 - in blood sterilization,
 - in medical and industrial research, and
 - in instrument calibrations
- The security and control of radioactive sources has been significantly enhanced per NRC and Agreement State requirements
- Integrated and comprehensive program in place in the U.S. for management and control of radioactive sources
- Continuing to work closely with domestic and international partners to improve security worldwide

History of NRC's CsCI Work

- 2005 The Energy Policy Act of 2005
 - Radiation Source Protection and Security Task Force is to be established
 - NRC is to fund a study by the National Academy of Science
- 2006 Task Force 1st Report issued
- 2008 National Academy study completed
- 2008 CsCI Working group report completed
- 2008 Public Workshop on the use of Cs-137
- 2008 ACMUI report
- 2010 Task Force 2nd report issued
- 2010 Draft Policy Statement published in *Federal Register*
- 2010 Nov. 8-9: Public Meeting on Draft Policy

2006 Task Force Report

- Conclusions:
 - No significant gaps that are not already being addressed
 - Current framework provides reasonable assurance that risk-significant sources (Category 1 and 2 sources) in use and storage are safe and secure through inspection and enforcement
- 10 Recommendations
- 18 Actions
- Established the 'CsCl Working Group' to determine if the feasibility of phasing-out the use of dispersible forms of CsCl in IAEA Cat. 1 and 2 quantities

2008 CsCI Working Group Report

- Immediate phase-out would not be feasible
- Step-wise phase-out could be feasible
- Challenges would have to be overcome
- Sufficient time would be necessary for replacement technologies to be established and for disposal pathways
- Sequences and time-frames would be critical
- Interim security measures are important

Advisory Committee for the Medical Use of Isotopes 2008 ACMUI Report

- “ACMUI Report on $^{137}\text{CsCl}$ Irradiators” (ML083030593)
- Purpose: provide input for NRC staff to develop Draft Policy Statement
- Issues addressed:
 - Practicality of alternatives, i.e. x-ray devices for blood irradiation and animal research
 - AAPM survey results
 - Linear accelerators
 - Alternative radionuclides
 - Further considerations for blood irradiation
 - Irradiator security
 - Alternative forms for ^{137}Cs sources

2010 Task Force Report

- Issued in Aug. 2010 (accessible as ML102230141)
- Four main topical areas/chapters:
 - Coordination and communication
 - Advances in the security and control of radioactive sources
 - Status of recovery final disposition of radioactive sources
 - Progress in the area of alternative technologies
- 11 recommendations
 - 4 directly related to CsCl sources (#'s 3, 4, 10, 11)
 - 1 indirectly related to CsCl sources (# 9)

2010 Task Force Report: Cs-137 Recommendations

- Recommendation 3: discontinue licensing exports (contingent on disposal capacity, alternative technologies, threat)
- Recommendation 4: continue evaluation of disposal options, including handling large number of CsCl sources
- Recommendation 10: investigate options for voluntary use of alternative technologies with initial focus on CsCl sources
- Recommendation 11: review discontinuation of licensing CsCl sources (contingent on alternatives and threat)
- Recommendation 9 (indirectly related): support research and development for alternative technologies

2010 Draft Policy Statement

- Published in the Federal Register (75 FR 37483), June 29, 2010:
 - to solicit public input
 - to announce a public meeting November 8-9, 2010
- 7 major statements
- discussion of specific issues:
 - Security and control of sources
 - Areas use
 - Disposal
 - NRC's perspectives on further security enhancements

2010 Public Meeting

- Issues for discussion were published in 2nd *Federal Register* Notice (75 FR 60149), June 29, 2010
- 6 technical issues
- Announcement of date and location

Next Steps

- Public Meeting comments and written submissions will be summarized
 - Comment period is open until December 17, 2010
 - Comments may be submitted to <http://regulations.gov>, Docket ID NRC-2010-0209
- NRC staff submits proposed final Policy Statement to the Commission – scheduled for April 2011
- Commission issues Policy Statement (will be published in *Federal Register*)