

Document Preparation Profile (DPP)

1. IDENTIFICATION

Document Category Safety Guide
Working ID: DS381
Proposed Title: Safety of Fuel Cycle R&D Facilities
Proposed Action: new document
Published Title/Date
Safety Series No.:
SS Committee(s): NUSSC, RASSC, WASSC
Technical Officer(s): Nocture, P.

2. OBJECTIVE

(In no more than 150 words describe what the document is intended to achieve and in particular, identify the target users and intended impact on them)

The inventory of radioactive material contained, handled and/or processed in facilities dedicated to the Research and Development on the nuclear fuel cycle (RDFs) may lead to safety events to the facility staff and researchers and in some cases to the public and the environment.

The objective of this publication is to provide guidance on the best practices based on lessons learnt from experience in Member States to ensure that the safety requirements related to such RDFs are complied with during all stages of their life cycle.

This safety guide is intended to be of use to designers, operating organizations and regulators to ensure the safety of reprocessing facilities. It should be read in conjunction with the “Safety Requirements for Fuel Cycle Facilities (DS316)”

3. BACKGROUND

(In no more than 150 words describe the rationale for the development of the document and provide a justification considering its added value over existing publications on the topic)

During its fifth Meeting, the Advisory Commission on Safety Standards identified the need for specific safety standards covering ‘other fuel cycle facilities’. After recommendations provided by a Consultancy Meeting held in October 1999, the CSS suggested in November 1999 that the guidance developed should be ‘facility related rather than theme or subject related’.

In its 2000 meetings, the Commission on Safety Standards endorsed the approach proposed by 8 to 12 May 2000 Technical Committee Meeting on the Status of Regulations for Fuel Cycle Facilities in Member States that the Secretariat proceed with the development of one safety requirements document, complemented with supporting safety guides for MOX fuel fabrication; uranium fuel fabrication; reprocessing; conversion and enrichment facilities.

The October 2004 NUSSC meeting agreed the development of an additional safety guide dedicated to the facilities that carry out nuclear research and development activities involving significant quantities of nuclear material.

The preparation of the proposed safety guide comes after the drafting of the Safety Requirements for fuel cycle facilities (DS316), and the Safety Guides for uranium fuel fabrication facilities (DS317), MOX fuel fabrication facilities (DS318) and conversion and enrichment facilities (DS344).

4. INTERFACES

(Summarize relationships between the document and other publications or documents in preparation, as well as any interaction with other organizations)

While the NUSSC will co-ordinate the document preparation, development and review, the RASSC and the WASSC should participate in the development and review process.

This Standard will have interfaces with the following:

- Objectives and Principles of Nuclear, Radiation, Radioactive Waste and Transport Safety (Safety Fundamentals) [DS 298 - In preparation]
- Preparedness and Response for a Nuclear or Radiological Emergency (Safety Requirements), GS-R-2
- Legal & Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety (Safety Requirements), GS-R-1
- Safety of Fuel Cycle Facilities (Safety Requirements), [DS316, in preparation]
- Quality Assurance for Safety in Nuclear Power Plants and other Nuclear Installations, Safety Series 50-C/SG-Q
- International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, Safety Series 115
- Regulations for the Safe Transport of Radioactive Material – 1996 Edition (safety Requirements), Safety Standards Series No. TS-R-1
- Predisposal Management of Radioactive Waste including Decommissioning (Safety Requirements), WS-R-2
- Predisposal Management of Low and Intermediate Level Radioactive Waste (Safety Guide), WS-G-2.5
- Decommissioning of Nuclear Fuel Cycle Facilities (Safety Guide), WS-G-2.4
- Safety Assessment for Predisposal Waste Management (Safety Guide) [DS 284 – In preparation]
- Management Systems for the Treatment, Handling and Storage of Radioactive Waste (Safety Guide). [DS336, in preparation]

5. OVERVIEW

(In no more than 150 words describe expected content of the document, such as summary of the scope, style, structure, terminology and any other points to take into account when drafting.)

Attached Table of Contents

This guide will apply to laboratories, pilot workshops and experimental facilities which store, handle and process uranium, plutonium and other transuranics, fission products and activated materials and as dedicated to:

- The study of chemical, metallurgical, radiological properties of specific radioactive materials like prototype nuclear fuels (before and after reactor irradiation) or nuclear material / waste arising from experimental processes.
- The research and the development of processes and equipment the use of which is envisaged later on a fuel cycle industrial scale (e.g. pilot for active waste conditioning)

It will provide specific safety recommendations for the siting, design, construction, commissioning, operation and decommissioning of these RDFs in accordance with the Safety Requirements for Fuel Cycle Facilities (DS316), and consistent with the other facility specific supporting guides for MOX fuel fabrication (DS318), Uranium fuel fabrication (DS317), Conversion and Enrichment (DS344), and Reprocessing (DS360).

It will not cover installations like irradiators, accelerators or research reactors.

6. PRODUCTION: Provisional schedule for preparation of the document, outlining expected dates for:

- Approval on DPP by the Safety Standards Committees: 2005/2006
- Approval on DPP by the CSS: June 2006
- Development: 3 CS from 4th quarter 2006
- First draft NUSSC, RASSC and WASSC: October 2007
- Committees for submission to Member States for comments: 2008
- Approval by the Committees for submission to the CSS: October 2008
- Endorsement by the CSS: June 2009
- Target publication date: 2010

Attachment: TABLE OF CONTENTS

INTRODUCTION

- Background:
 - > Diversity of R&D facilities with significant radioactive material inventories.
 - > Need for design flexibility and constant evolution constrains due to the R&D nature
 - > Organization for R&D activities, researchers/operators/sub-contactors (e.g. for radiation protection, effluents and waste treatment or maintenance)
 - > Specific waste management when no existing treatment roads
 - > Use of R&D facilities as industrial production facilities
- Scope: safety issues for R&D facilities dedicated to the nuclear fuel cycle except irradiators, accelerators and research reactors.
- Structure: similar to the other Safety Guides, in line with the Safety Requirements for FCFs

GENERAL SAFETY RECOMMENDATIONS

Main risks from which man and the environment need to be protected

- Defense in depth implementation
- Graded approach

SITING

Proximity of the public and sensibility of the environment

External hazards

Ability to receive external emergency support and supplies

Transportation of materials

DESIGN

General

- Safety functions:
 - Containment against dispersion of radioactive material and chemical hazards; protection against external irradiation; prevention of criticality
- Design basis accidents and safety analysis
 - Fire, explosion, criticality accident
- Specific engineering design safety provisions:
 - Prevention of dispersion of radioactive material
 - Containment systems (glove boxes, ventilation)
 - Areas classifications/monitoring
 - Prevention of external irradiation:
 - Shielding/remote operation
 - Areas classifications/monitoring
 - Prevention of criticality

Hazards of nuclear origins

- Dispersion of radioactive material
 - Loss of static containment (corrosion, irradiation) for liquids/ gases/powders;
 - Loss of ventilation
- External exposure
- Criticality
- Risk from decay heat
- Risk from radiolysis

Non-nuclear hazards of internal origin

- Fire and internal explosion
- Loss of coolant and other process media
- Loss electrical power, failure of I&C systems
- Dropped loads
- Mechanical failure/corrosion
- Internal flooding
- Use of chemical products (toxicity, corrosion)
- Use of pressurized equipment

Non-nuclear hazards of external origin

Instrumentation and control (I&C)

Process control; criticality alarm systems; fire detection and fighting systems; radiation and contamination monitoring systems; control of effluents discharge

Waste management

Human factor considerations

Need for flexibility; constrain from operation organization

Safety analysis

CONSTRUCTION

- QA programme
- “design change” procedure
- Verification of shielding efficiency
- Verification for ability to maintenance (ventilation)

COMMISSIONING

OPERATION (INCLUDING MODIFICATIONS AND MAINTENANCE)

- Characteristics of RDFs to take into account for the implementation of the Safety requirements (DS316)
- Management including organization, qualification and training of personnel
- Plant operation
- Maintenance and periodic testing
- Modification control
- Criticality control
- Radiation protection (control of external and internal doses)
- Conventional safety management
- Waste and effluents management Emergency preparedness
- Specific recommendations for use of RDFs as industrial production facilities

DECOMMISSIONING