



Regulatory Gap 9: General Design Criteria And Baseline Design Criteria GDC/BDC

What Are GDC/BDC?

The NRC establishes minimum requirements for proposed facilities or applications of licensed radioactive materials that provide:

- assurance that important to safety SSCs will have the ability and reliability to perform their intended safety functions
- assurance that uncertainties and errors, from design and analysis, and unknowns, are adequately addressed
- adequate defense in depth
- redundancy and diversity
- assurances that balance of plant and unanalyzed situations do not negatively impact safety

SSC = Structure, System, or Component

NRC regulations frequently identify these minimum requirements by terminology:

- General Design Criteria (GDC) or Baseline Design Criteria (BDC)
- Where used, GDC and BDC are essentially synonymous, although the GDC term is more prevalent in the regulations and tends to be more specifically stated.

Currently ...

- Reprocessing and recycling (R&R) facilities are production facilities
- Regulated under 10 CFR Part 50
 - GDC in 50.34 and Appendix A
 - Other sections of Part 50 imply additional GDC (e.g., Appendix F, Appendix I)
- GDC specific to R&R are needed to address the large quantities and types of radionuclides at these facilities

Relevant Sources For Potential R&R GDC/BDC

NUREG-1909, "Background, Status, and Issues Related to the Regulation of
Advanced Spent Nuclear Fuel Recycle Facilities"

Part 50:

Previously Proposed Appendix P

- 50.34(a)(3) (i) footnote: “GDC for chemical processing facilities are being developed”
- “General Design Criteria for Fuel Reprocessing Plants”
 - 39 Federal Register 26293, July 18th, 1974
 - Indefinitely deferred on April 19th, 1984 until needed for NRC’s regulation of a reprocessing facility (49 Federal Register 16699, April 19th, 1984).
- 27 GDC in 7 categories

Part 50:

Previously Proposed Appendix Q

- 50.34(a)(3) (i) footnote: “GDC for chemical processing facilities are being developed”
- “Design Criteria for Protection of Fuel Reprocessing Plants and Licensed Material Therein”
 - 39 Federal Register 26296, July 18th, 1974
 - Indefinitely deferred on April 19th, 1984 until needed for NRC’s regulation of a reprocessing facility (49 Federal Register 16699, April 19th, 1984).
- 19 GDC in 3 categories

NRC Staff Review and Status

- Reviewed the existing GDCs/BDCs and relevant documents
 - Regulations have no thresholds for applying existing GDCs/BDCs
- Identified
 - 10 potential categories of GDCs/BDCs
 - 77 potential areas within the ten categories
- Found significant fraction of areas could become draft GDCs

Relative Consequences

Material	Relative Inhalation Dose/mass
LEU, 5%	1
U-235, 100%	5
MOX, 5% Pu-239, 95% U-238	19,000
MOX, 5% Puf, Weapons-grade Pu	25,000
MOX, 5% Puf, Reactor Pu	230,000
MOX, 5% Puf, Reactor Pu, 0.25% Am	310,000
SNF, Cs, Sr, U, TRUs	220,000
Fission Products – Cs + Sr	41,000

SNF, FPs based upon 60,000 MWD/MTIHM Burnup

Ten Potential Draft GDC/BDC Categories

- Overall/General
- Multiple Confinement and Containment Barriers, and Systems
- Process Safety Features
- Nuclear Criticality Safety
- Radiological Protection
- Physical Security
- MC&A
- Fuel and Radioactive Waste
- Siting
- Decommissioning

Some Samples Of Potential Areas For GDCs/BDCs

- Quality standards/records
- Minimize risk from R&R
- Fire and explosion protection
- Negative pressure differential
- Flammable gas monitoring and control
- Habitability
- Seismic Protection
- Emergency process heat removal
- Control Room
- Criticality Safety Monitoring and Alarm
- ALARA
- Shielding
- Waste Management
- Aircraft Impact
- Design for Eventual Decommissioning

Path Forward

- Continue development into a regulatory/technical bases
- Identify potential draft GDCs/BDCs
- Discuss with stakeholders at future workshops



Regulatory Gap 9: Background Slides

BDC/GDC

Relevant Sources For Potential BDC/GDC

Regulations:

- Part 20: Basic radiation protection/principles
- Part 50: Licenses Production Facilities
- Part 52: Design Certification etc. for Part 50
- Part 70: Licenses SNM/materials
- Part 72: Licenses

Proposed Regulations:

- Part 50: Proposed Appendix P
- Part 50: Proposed Appendix Q

Other Documents:

- NEI White Paper
- NUREG-1909

10 CFR 20 – “Part 20”

- Part 20 – “Standards for Protection against Radiation.”
 - Provides the basic radiation limits and requirements for using licensed radioactive materials.

10 CFR 50 & 52

“Parts 50 and 52”

- Part 50 – “Domestic Licensing of Production and Utilization Facilities.”
 - Applies to reactors and reprocessing plants
 - Extensively used for power reactors (LWRs – light water reactors).
 - Reprocessing plants are considered to be production facilities.
- Part 52 – “Licenses, Certifications, and Approvals for Nuclear Power Plants.”
 - Used for one-step licensing of nuclear power plants
 - Contains numerous references to the GDC of Part 50.

10 CFR 70 – “Part 70”

- Part 70 – “Domestic Licensing of Special Nuclear Material.”
 - Regulates the SNM used by fuel cycle facilities
 - Used primarily for uranium enrichment and fuel fabrication facilities
 - Applied to one uranium-plutonium mixed oxide (MOX) fuel fabrication plant.

10 CFR 72 – “Part 72”

- Part 72 – “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-level Radioactive Waste, and Reactor-Related Greater Than Class C Waste.”
 - Applied primarily to dry storage of spent nuclear fuel (SNF).

Proposed Regulations (Late 1970s/Early 1980s)

- Proposed Appendix P to Part 50 – “General Design Criteria for Fuel Reprocessing Plants”
- Proposed Appendix Q to Part 50 – “Design Criteria for Protection of Fuel Reprocessing Plants and Licensed Material Therein”