Building a Smarter Fuel Cycle Inspection Program

Division of Fuel Management

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Agenda

- Disposition of feedback from Nuclear Energy Institute (NEI) and URENCO USA (UUSA)
- Decision-making methodology
- Proposed recommendation
- Questions

Note: *The information included in this presentation is being shared in draft form so that stakeholders can see how their comments and proposals have been incorporated in the recommended changes to the inspection program.*

Disposition of Stakeholder Feedback

- Had significant number of stakeholder interactions
  - Held 8 public meetings
    - Received comments from members of the public
    - Engaged in discussion with NEI and industry during the meetings
  - Received multiple letters from NEI and UUSA
- Addressed feedback throughout the process

Disposition of Stakeholder Feedback

- Program specific considerations
  - Overlaps and efficiencies in current Inspection Procedures (IPs)
    - Maintenance/Surveillance, Waste Management
  - Resident Inspector Program
    - Benchmarking with Rector Oversight Program
    - Hours and functional areas inspected
  - Risk insights and Maturity of Integrated Safety Analysis (ISA)
  - Licensee Performance Review
  - Flexibility – range of hours for IPs
  - Corrective Action Program
  - Public concerns with licensee self-oversight

Development of Proposed Recommendation

Development of Proposed Recommendation

- Generic program considerations
  - Review of historical changes to inspection program
  - Review of compliance history
  - Analysis of operating experience (OpE) and inspection data
  - Insights gathered from inspectors and other subject mater experts
  - Maturity of the licensees' safety programs
  - Diversity of the facilities by categories and diversity of facilities within the category

Development of Proposed Recommendation

- Identification of Inspection Technical Areas
  - Criticality Safety
  - Operations/Chemical Safety
  - Fire Safety
  - Environmental
  - Radiation Protection
  - Transportation
  - Emergency Preparedness
  - Material Control and Accounting (MC&A)

Development of Proposed Recommendation

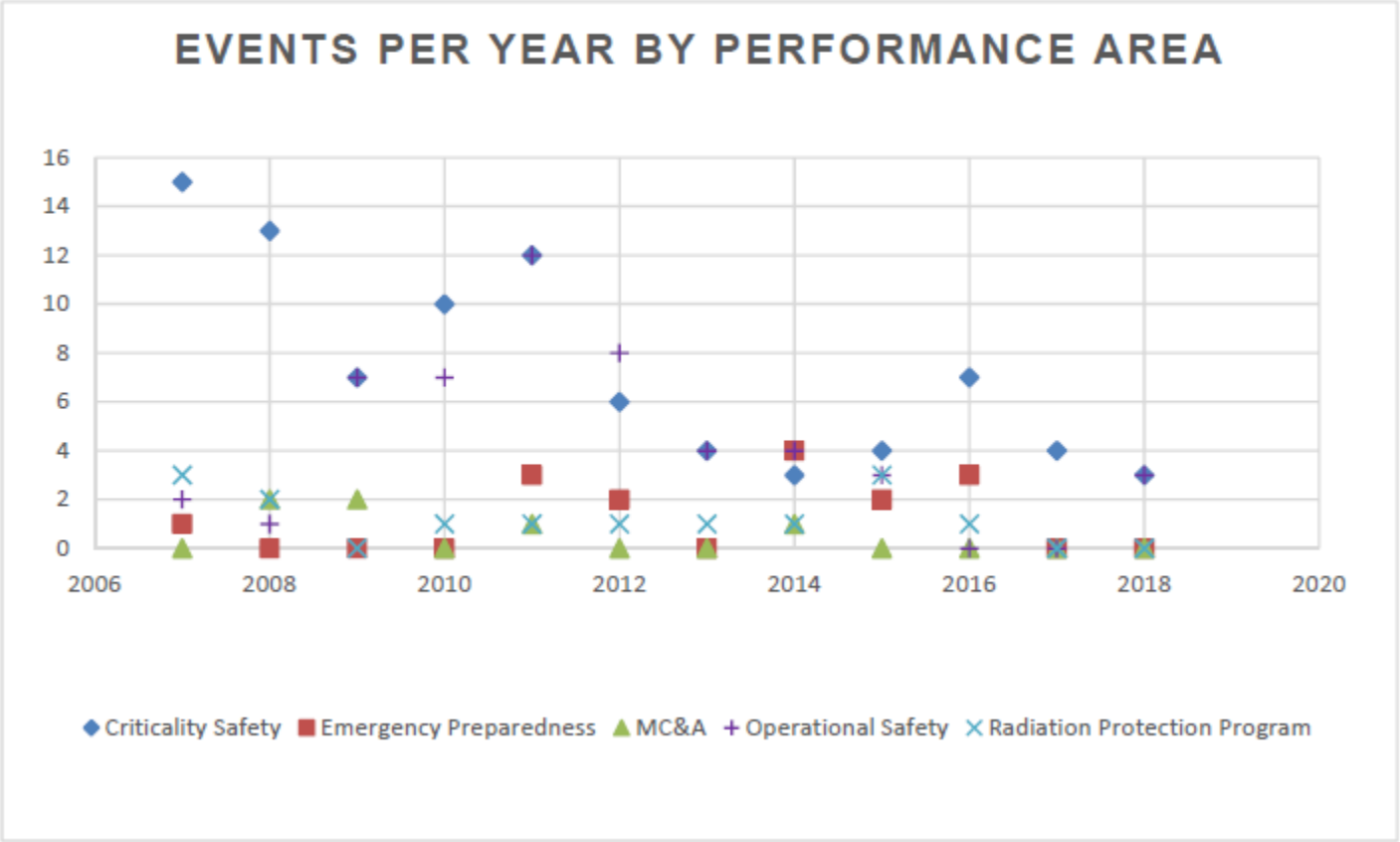
- Qualitative factors used for ranking importance of technical areas as Tier 1, Tier 2, Tier 3
  - Integrated Safety Analysis
    - Accident sequences and consequences for each area
  - Operating Experience
  - Regulatory Requirements
  - Public Interest
  - Engineering Judgement

Development of Proposed Recommendation

	Accident Sequences	Operating Experience	Regulatory Requirements
Criticality	*High*	*High*	*Medium*
Chemistry	*High*	*High*	*Low*
Fire	*Medium*	*Medium*	*Medium*
Environmental	*Low*	*Low*	*Low*
Radiation Protection	*Medium*	*Low*	*Low*
Transportation	*Low*	*Low*	*Medium*
Emergency Preparedeness	*Medium*	*Medium*	*Low*
Material Control & Accounting	*N/A*	*Medium*	*High*

- Note: Engineering Judgement and Public Interest were also factored

Development of Proposed Recommendation



Source: Fuel Cycle Annual Operating Experience Report 2018 (ADAMS No. ML19004A407)

Development of Proposed Recommendation

- Results of ranking

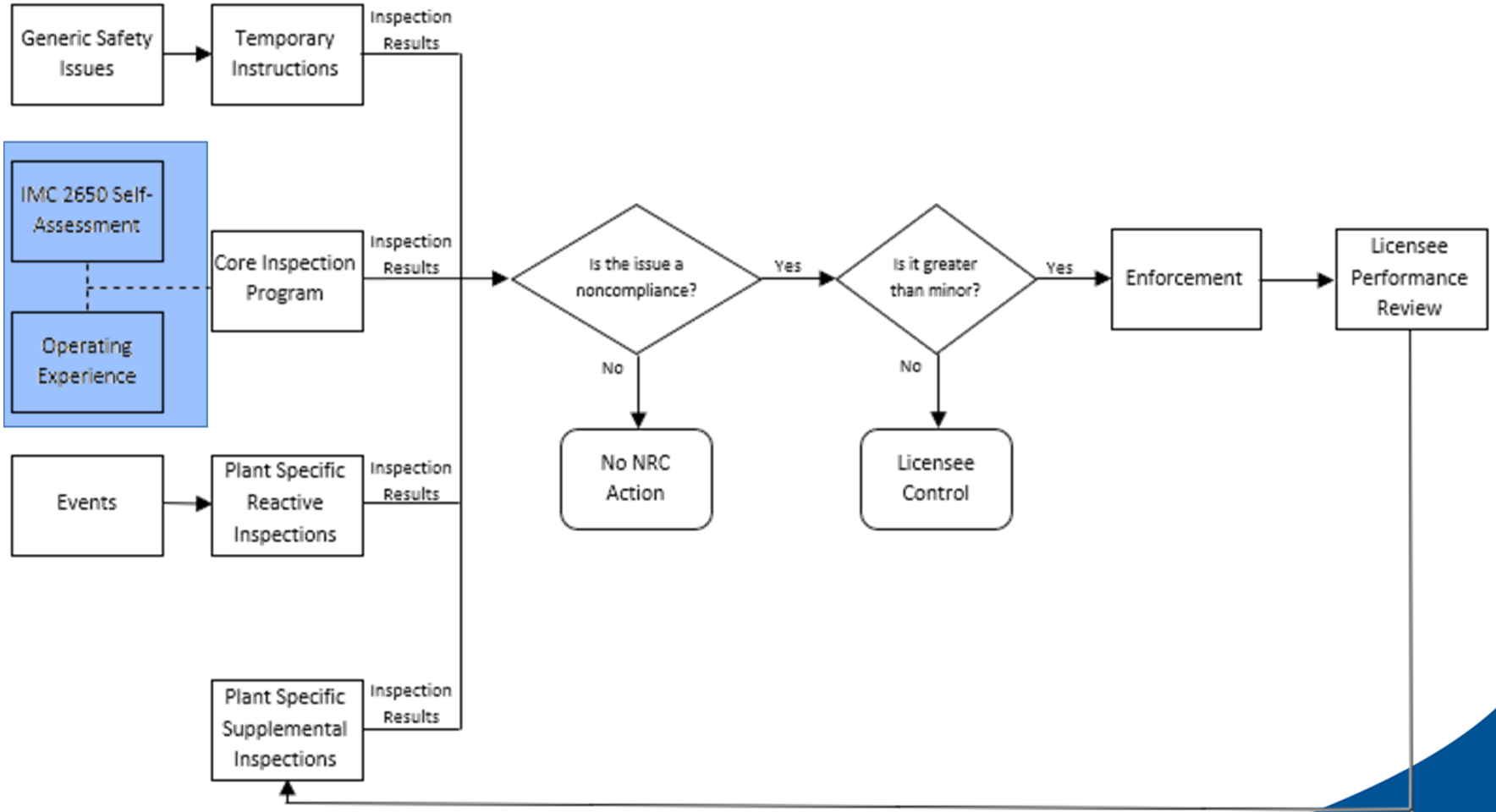
Technical Areas (Safety)	
Criticality Safety	Tier 1
Chemical Safety	
Fire Safety	Tier 2
Emergency Preparedness	
Radiation Protection	
Transportation	Tier 3
Environmental	

Technical Areas (Safeguards)	
MC&A	Tier 1/Tier 2

Development of Proposed Recommendation

- Tier 1
  - Maintain high level of inspection effort
  - Annual Frequency
  - Benefit from team inspections
- Tier 2
  - Maintain moderate level of inspection effort
  - Biennial Frequency
  - Benefit from team inspections
- Tier 3
  - Maintain moderate level of inspection effort
  - Triennial Frequency
  - Included flexibility or range of hours
- Corrective Action Program
  - Frequency changes for some Tier 2 and Tier 3 inspection areas

Framework of Proposed Recommendation



U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Working Group Proposed Recommendation

		Category I Fuel Facility		Category III Fuel Fabrication Facility		Uranium Conversion Facility		Gas Centrifuge Facility				Laser Enrichment Facility	
Function/ Program Areas	Procedure or Procedure Suite	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Approved CAP Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)
SAFETY OPERATIONS													
Plant Operations	88020 (OPR)	- Annual	-105	Annual (2 per year)	~~60~~ 120	Annual (2 per year)	~~60~~ 90	Annual (2 per year)	~~60~~ 90	Annual (2 per year)	90	-	-
	88135+ (Resident Inspection Program)	Annual	~~797~~ 752	-	-	-	-	-	-	-	-	-	-
Criticality Safety	88015	Annual (~~3~~ 2 per year)	~~192~~ 120	Annual (2 per year)	~~64~~ 60	-	-	Annual (2 per year)	~~64~~ 60	Annual (2 per year)	60	-	-
Fire Protection	88055 (FPB)	- Biennial	- 320	~~Annual~~ Biennial	~~32~~ 60	~~Annual~~ Biennial	~~32~~ 60	~~Annual~~ Biennial	~~32~~ 60	Triennial	60	-	-
	~~88054 (FPT)~~	~~Triennial*~~	~~90~~	~~Triennial*~~	~~90~~	~~Triennial*~~	~~90~~	~~Triennial*~~	~~90~~	-	-	-	-

Working Group Proposed Recommendation

		Category I Fuel Facility		Category III Fuel Fabrication Facility		Uranium Conversion Facility		Gas Centrifuge Facility		Laser Enrichment Facility	
Function/ Program Areas	Procedure or Procedure Suite	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)
SAFEGUARDS											
MC&A	Procedures as in IMC 2683	Annual	~~152 196~~ 120	~~Annual~~ Biennial	~~54 72~~ 60	-	-	~~Annual~~ Biennial	~~62 84~~ 60	-	-
	MC&A Observation	Triennial	30	Triennial	30	-	-	Triennial	30	-	-

Working Group Proposed Recommendation

		Category I Fuel Facility		Category III Fuel Fabrication Facility		Uranium Conversion Facility		Gas Centrifuge Facility				Laser Enrichment Facility	
Function/ Program Areas	Procedure or Procedure Suite	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Approved CAP Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)
RADIOLOGICAL CONTROLS													
Radiation Protection	88030 (RP)	Biennial ~~with annual subsections~~	~~64~~ 60	Biennial ~~with annual subsections~~	~~64~~ 60	Biennial ~~with annual subsections~~	~~64~~ 60	Biennial ~~with annual subsections~~	~~64~~ 60	Triennial	60	-	-
Environmental Protection	88045 (Effluent Control and Env.)	~~Annual~~ Triennial	~~32~~ 30-60	~~Annual~~ Triennial	~~32~~ 30-60	~~Annual~~ Triennial	~~32~~ 30-60	~~Annual~~ Triennial	~~32~~ 30-60	5 Years	30-60	-	-
~~Waste Management~~	~~88035 (WM)~~	~~Biennial~~	~~32~~	~~Biennial~~	~~32~~	~~Biennial~~	~~32~~	~~Biennial~~	~~32~~	-	-	-	-
Transportation	86740 (T)	~~Biennial~~ Triennial	~~32~~ 30-60	~~Biennial~~ Triennial	~~32~~ 30-60	~~Biennial~~ Triennial	~~32~~ 30-60	~~Biennial~~ Triennial	~~32~~ 30-60	5 Years	30-60	-	-
FACILITY SUPPORT													
~~Maintenance/ Surveillance~~	~~88025 (MS)~~	-	-	~~Annual~~	~~30~~	~~Annual~~	~~30~~	~~Annual~~	~~30~~			-	-
Emergency Preparedness	88050 (EP)	~~Annual~~ Biennial	~~32~~ 30	~~Annual~~ Biennial	~~32~~ 30	~~Annual~~ Biennial	~~32~~ 30	~~Annual~~ Biennial	~~32~~ 30	Triennial	30	-	-
	88051 (Exercise Observation)	Biennial	48	Biennial	48	Biennial	48	Biennial	48	Biennial	48	-	-
Plant Modifications (Annual)	88070	Annual unless 88072 is performed	~~32*~~ 30*	Annual unless 88072 is performed	~~32*~~ 30*	Annual unless 88072 is performed	~~32*~~ 30*	Annual unless 88072 is performed	~~32*~~ 30*	~~Annual unless 88072 is performed~~	~~32*~~	-	-
Plant Modifications (Triennial)	88072	Triennial	~~96*~~ 90*	Triennial	~~96*~~ 90*	Triennial	~~96*~~ 90*	Triennial	~~96*~~ 90*	Triennial	90*	-	-
Corrective Action Program	71152	-	-	-	-	-	-	-	-	Triennial	90	-	-

Appendix B – Current and Proposal

	Category I Fuel Facility		Category III Fuel Fabrication Facility		Uranium Conversion		Gas Centrifuge Facility			Laser Enrichment Facility	
Fuction Areas Core Hours	**Current Program**	**Proposal**	**Current Program**	**Proposal**	**Current Program**	**Proposal**	**Current Program**	**Proposal**	**Proposal CAP**	**Current Program**	**Proposal**
Plant Operations	797	857	60	120	60	90	60	90	90	0	0
Criticality Safety	192	120	64	60	0	0	64	60	60	0	0
Fire Protection	30	15	51	30	51	30	51	30	20	0	0
MC&A	196	120	72	30	0	0	64	30	30	0	0
MC&A Observation	10	10	10	10	10	10	10	10	10	0	0
Security	241	241	8	8	8	8	184	184	184	136	136
Radiation Protection	32	30	32	30	32	30	32	30	20	0	0
Environmental Protection	32	10	32	10	32	10	32	10	6	0	0
Waste Management	16	0	16	0	16	0	16	0	0	0	0
Transportation	16	10	16	10	16	10	16	10	6	0	0
Maintenance/Surveillance	0	0	30	0	30	0	30	0	0	0	0
Emergency Preparedness	56	39	56	39	56	39	56	39	34	0	0
Plant Modifications	53	50	53	50	53	50	53	50	30	0	0
Corrective Action Program	0	0	0	0	0	0	40	30	30	0	0
Total Annualized Hours =	**1672**	**1502**	**500**	**397**	**364**	**277**	**708**	**573**	**520**	**136**	**136**

Notes:

- Inspection hours shown on proposal assumes use of minimum hours as core program. The use of range of hours will be dependent on inspection scope
- MC&A Observation not currently illustrated in Appendix B. (Hours used: 30 hours, triennial)
- CAP hours not currently illustrated in Appendix B (Hours used: 120 hours triennial)

What happened with options 1-2?

- Based on extensive stakeholder engagements, the WG identified the need to evaluate additional approaches informed by previous options and stakeholder feedback
- Concerns about a new framework for inspections (predictability and implementation)
- Public concerns about reduction in inspection hours and reliance on licensee self-oversight

What's Next?

- Finalize WG report documenting recommendations (November 2019)
- Develop Plan for Phase 2 to incorporate recommendations into inspection program (October 2020)
  - Updates to Inspection Manual Chapter
  - Updates to IPs, Resident Inspector IPs Scope
  - Look for efficiencies on preparation and documentation of inspection activities
- Perform inspections using updated program (Calendar Year 2021)

Questions

Appendix B Markup – Proposal, NEI

		Category I Fuel Facility		Category III Fuel Fabrication Facility		Uranium Conversion Facility		Gas Centrifuge Facility	
Function/ Program Areas	Procedure or Procedure Suite	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)
SAFETY OPERATIONS									
Plant Operations	88020 (OPR)	- Annual -	- 105 0[1]	Annual (2 per year)	~~60~~ 120 48-60	Annual (2 per year)	~~60~~ 90 48-60	Annual (2 per year)	~~60~~ 90 48-60
	88135+ (Resident Inspection Program)	Annual	~~797~~ 752 797	-	-	-	-	-	-
Criticality Safety	88015	Annual (2 per year)	~~192~~ 120 72-90	Annual (2 per year)	~~64~~ 60 48-60	-	-	Annual (2 per year)	~~64~~ 60 48-60
Fire Protection	88055 (FPB)	Biennial -	30 0[1]	~~Annual~~ Biennial Biennial	~~32~~ 60 48-60	~~Annual~~ Biennial Biennial	~~32~~ 60 48-60	~~Annual~~ Biennial Biennial	~~32~~ 60 48-60
	~~88054 (FPT) 88054 (FPT)~~	~~Triennial* Triennial*~~	~~90 90~~	~~Triennial* Triennial*~~	~~90 90~~	~~Triennial* Triennial*~~	~~90 90~~	~~Triennial* Triennial*~~	~~90 90~~

NRC Recommendation in Blue
NEI Proposal #2 in Green

[1] Keep these IPs with the Resident Inspection Program, as is currently implemented today

Appendix B Markup – Proposal, NEI

		Category I Fuel Facility		Category III Fuel Fabrication Facility		Uranium Conversion Facility		Gas Centrifuge Facility	
Function/ Program Areas	Procedure or Procedure Suite	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)
SAFEGUARDS									
MC&A	Procedures as in IMC 2683	2 Annual Annual	~~152-196~~ 120 72-90	~~Annual~~ Biennial Biennial	~~54-72~~ 60 48-60	-	-	~~Annual~~ Biennial Biennial	~~62-84~~ 60 48-60
	MC&A Observation	Triennial Triennial	30 24-30	Triennial Triennial	30 24-30	-	-	Triennial Triennial	30 24-30
RADIOLOGICAL CONTROLS									
Radiation Protection	88030 (RP)	Biennial ~~with annual subsections~~	~~64~~ 60 24-30	Biennial ~~with annual subsections~~	~~64~~ 60 24-30	Biennial ~~with annual subsections~~	~~64~~ 60 24-30	Biennial ~~with annual subsections~~	~~64~~ 60 24-30
Environmental Protection	88045 (Effluent Control and Env.)	~~Annual~~ Triennial Biennial	~~32~~ 30-60 24-30	~~Annual~~ Triennial Biennial	~~32~~ 30-60 24-30	~~Annual~~ Triennial Biennial	~~32~~ 30-60 24-30	~~Annual~~ Triennial Biennial	~~32~~ 30-60 24-30
~~Waste Management~~ Waste Management	~~88035 (WM)~~ ~~88035 (WM)~~	~~Biennial~~ ~~Biennial~~	~~32~~ ~~32~~	~~Biennial~~ ~~Biennial~~	~~32~~ ~~32~~	~~Biennial~~ ~~Biennial~~	~~32~~ ~~32~~	~~Biennial~~ ~~Biennial~~	~~32~~ ~~32~~

NRC Recommendation in Blue
NEI Proposal #2 in Green

Appendix B Markup – Proposal, NEI

		Category I Fuel Facility		Category III Fuel Fabrication Facility		Uranium Conversion Facility		Gas Centrifuge Facility	
Function/ Program Areas	Procedure or Procedure Suite	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)	Inspection Frequency	Estimated Resources per IP (hrs)
Transportation	86740 (T)	~~Biennial~~ Triennial Triennial	~~32~~ 30-60 24-30	~~Biennial~~ Triennial Triennial	~~32~~ 30-60 24-30	~~Biennial~~ Triennial Triennial	~~32~~ 30-60 24-30	~~Biennial~~ Triennial Triennial	~~32~~ 30-60 24-30
FACILITY SUPPORT									
~~Maintenance/ Surveillance~~ ~~Maintenance/ Surveillance~~	~~88025 (MS)~~ ~~88025 (MS)~~	-	-	~~Annual~~ ~~Annual~~	~~30~~ ~~30~~	~~Annual~~ ~~Annual~~	~~30~~ ~~30~~	~~Annual~~ ~~Annual~~	~~30~~ ~~30~~
Emergency Preparedness	88050 (EP)	~~Annual~~ Biennial Biennial	~~32~~ 30 24-30	~~Annual~~ Biennial Biennial	~~32~~ 30 24-30	~~Annual~~ Biennial Biennial	~~32~~ 30 24-30	~~Annual~~ Biennial Biennial	~~32~~ 30 24-30
	88051 (Exercise Observation)	Biennial	48 38-48	Biennial	48 38-48	Biennial	48 38-48	Biennial	48 38-48
Plant Modifications (Annual)	88070	Annual unless 88072 is performed	~~32~~ 30 24-30	Annual unless 88072 is performed	~~32~~ 30 24-30	Annual unless 88072 is performed	~~32~~ 30 24-30	Annual unless 88072 is performed	~~32~~ 30 24-30
Plant Modifications (Triennial)	88072	Triennial	~~96~~ 90 72-90	Triennial	~~96~~ 90 72-90	Triennial	~~96~~ 90 72-90	Triennial	~~96~~ 90 72-90

NRC Recommendation in Blue
NEI Proposal #2 in Green

Appendix B Markup – Proposal, UUSA

		Gas Centrifuge Facility			
Function/ Program Areas	Procedure or Procedure Suite	Inspection Frequency	Estimated Resources per IP (hrs)	Approved CAP Frequency	Estimated Resources per IP (hrs)
SAFETY OPERATIONS					
Plant Operations	88020 (OPR)	Annual (2 per year) Annual	~~60~~ 90 90	Annual (2 per year)	90
	88135+ (Resident Inspection Program)	-	-	-	-
Criticality Safety	88015	Annual (2 per year) Annual	~~64~~ 60 90	Annual (2 per year)	60
Fire Protection**	88055 (FPB)	Biennial Biennial	60 60	Triennial Triennial	60 45
	~~88054 (FPT)~~	~~Triennial*~~	~~90~~	-	-
MC&A	Procedures as in IMC 2683	~~Annual~~ Biennial Biennial	~~62-84~~ 60 60	60	60
	MC&A Observation	Triennial	30	60	60

NRC Recommendation in Blue
URENCO Proposal in Orange

Appendix B Markup – Proposal, UUSA

		Gas Centrifuge Facility			
Function/ Program Areas	Procedure or Procedure Suite	Inspection Frequency	Estimated Resources per IP (hrs)	Approved CAP Frequency	Estimated Resources per IP (hrs)
RADIOLOGICAL CONTROLS					
Radiation Protection	88030 (RP)	Biennial ~~with annual subsections~~ Annual	~~64~~ 60 30	Triennial Triennial	60 30
Environmental Protection	88045 (Effluent Control and Env.)	~~Annual~~ Triennial	~~32~~ 30-60	5 Years Triennial	30-60 30
~~Waste Management~~	~~88035 (WM)~~	~~Biennial~~	~~32~~		
Transportation	86740 (T)	Biennial Triennial Triennial	~~32~~ 30-60 30	5 Years Triennial	30-60 15
FACILITY SUPPORT					
~~Maintenance/ Surveillance~~	~~88025 (MS)~~	~~Annual~~	~~30~~		
Emergency Preparedness	88050 (EP)	~~Annual~~ Biennial Biennial	~~32~~ 30 30	Triennial Triennial	30 30
	88051 (Exercise Observation)	Biennial	48	Biennial	48

NRC Recommendation in Blue
URENCO Proposal in Orange

Appendix B Markup – Proposal, UUSA

		Gas Centrifuge Facility			
Function/ Program Areas	Procedure or Procedure Suite	Inspection Frequency	Estimated Resources per IP (hrs)	Approved CAP Frequency	Estimated Resources per IP (hrs)
Plant Modifications (Annual)	88070	Annual unless 88072 is performed	~~32~~ 30	~~Annual unless 88072 is performed~~ -	~~32*~~ 0
Plant Modifications (Triennial)	88072	Triennial	~~96~~ 90	Triennial	90
Corrective Action Program	71152	-	-	Triennial Triennial	90 90

NRC Recommendation in Blue
URENCO Proposal in Orange