



**Analysis of the Causes
of Regional Differences
in the Number of Inspection Findings of
Very Low Significance (Green) and
Non-Escalated Violations**

December 2014

EXECUTIVE SUMMARY

Regional Differences and Trends in Green Findings and Non-escalated Violations

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a study to determine the causes of regional differences in the identification and resolution of very-low-safety-significance inspection findings and non-escalated violations. This study addresses Recommendation 1 from [Government Accountability Office \(GAO\) report, GAO 13-743 “Nuclear Power: Analysis of Regional Differences and Improved Access to Information Could Strengthen NRC Oversight,” dated September 12, 2013.](#)

As part of this study, the staff conducted a tabletop exercise involving staff and management from all four regions and headquarters. The tabletop exercise was comprised of questions based on both scenario-based and non-scenario-based settings. Responses to the questions revealed regional differences in Reactor Oversight Process (ROP) implementation and reasoning. In particular, the tabletop exercise identified differences in implementation of the IMC 0612, “Power Reactor Inspection Reports,” more-than-minor (MTM) screening questions and finding identification assignment. The scenario responses generally aligned with the observed historic regional differences except they did not show Region IV as identifying more findings than the other regions.

The analysis team also elicited general feedback from the participants to identify other potential causal factors into the observed regional differences. The analysis team identified two top influencing causes:

- Some program requirements and guidance that can be followed and interpreted differently to produce different outcomes
- Different regional practices affect ROP implementation methods and outcomes

The analysis team identified that the ROP self-assessment process did not seek to evaluate the consistency with which regional offices identify, assess and document green findings or non-cited violations and considered this be a contributing factor.

The analysis team concluded that certain enhancements could improve ROP objectivity and predictability associated with inspection findings of very low safety significance. Potential enhancements include procedure changes, standardized training, management awareness briefings, and augmented self-assessment activities.

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BACKGROUND

The Government Accountability Office (GAO) assessed the U.S. Nuclear Regulatory Commission's (NRC's) oversight of nuclear reactors in its [September 2013 GAO audit, GAO-13-743, "Analysis of Regional Differences and Improved Access to Information Could Strengthen NRC Oversight."](#) The GAO highlighted differences in the number of green findings and non-escalated violations in the regions since the inception of the current Reactor Oversight Process (ROP), as shown in Figure 1. The numbers of findings with greater risk significance were similar across the regions. Figure 2 shows the standard deviation of the number of findings for all regions by year. A slightly positive trend in the standard deviation indicates that regional differences in the number of green findings are increasing.

Figure 1: Non-escalated findings by NRC region and by year, calendar years 2000 to 2012

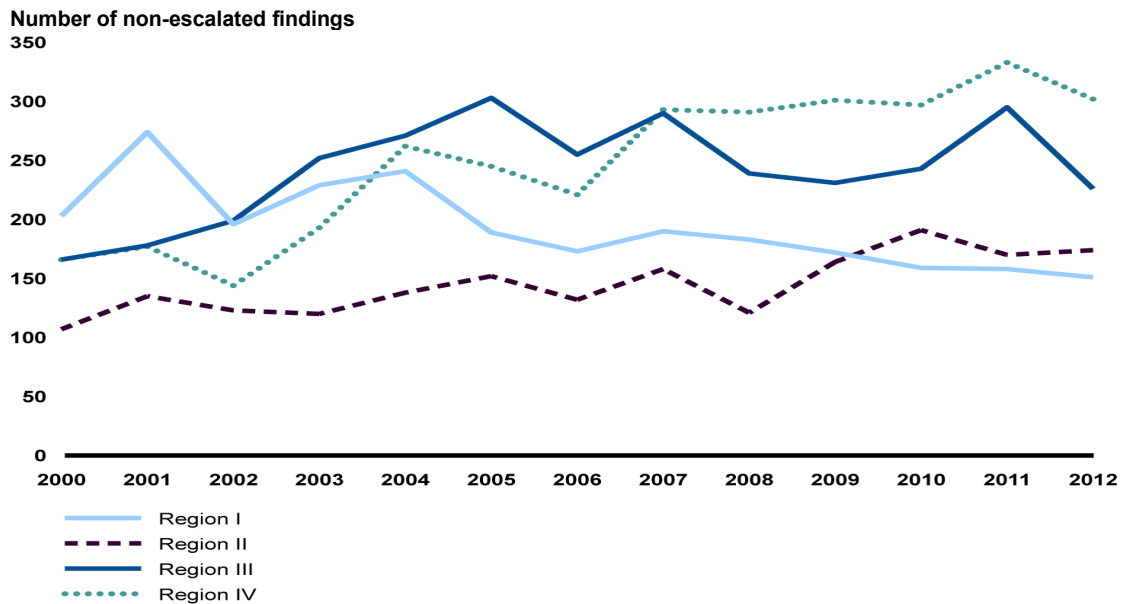


Figure 2: Finding standard deviation

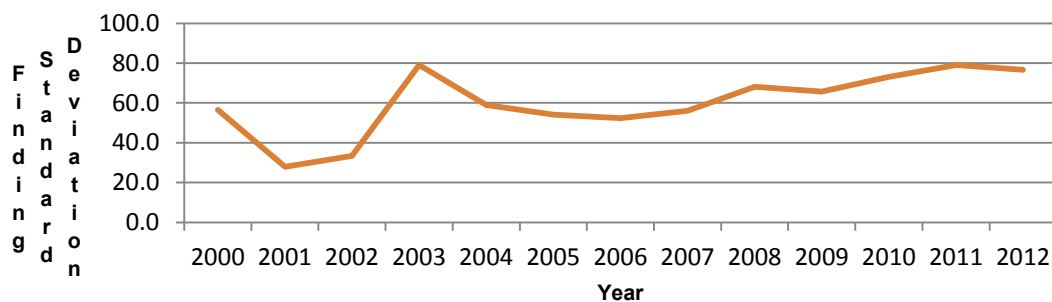


Figure 3 illustrates the differences in the number of green findings and non-escalated violations by site and by year over the 13-year period from 2000 through 2012. The analysis team noted that Comanche Peak, the site with the least number of findings in Region IV, had more findings than Oconee, the site with the most findings in Region II. Also only one Region III site had fewer findings than the site with the most findings in Region II. It is unlikely that the lack of overlap is solely the result of differences in individual licensee performance.

Figure 3: Green findings and non-escalated violations by year, site, and region, sorted high to low

Site Name	Fleet	00	01	02	03	04	05	06	07	08	09	10	11	12	R-1	R-2	R-3	R-4	All
Cooper	Nebraska PPD	27	25	36	27	26	38	18	24	16	31	21	36	47				372	372
Palo Verde	Arizona PP	11	7	9	8	50	32	43	43	23	30	15	17	26				314	314
Indian Point*	Entergy	55	21	24	20	27	16	29	20	15	19	17	13	16	292*				292
San Onofre	SC Edison	24	8	11	17	17	16	14	22	28	38	48	23	19				285	285
Wolf Creek	Wolf Creek	8	6	3	9	9	7	15	29	43	45	38	37	28				277	277
Point Beach	NextEra	12	13	10	30	24	28	25	27	31	18	18	13	20			269		269
Davis-Besse	First Energy	13	2	15	112	23	12	15	14	9	15	10	16	8			264		264
Diablo Canyon	PGE	17	9	21	26	27	22	16	6	15	21	42	20	17				259	259
Dresden	Exelon	26	13	20	22	28	13	23	19	10	21	21	22	11			249		249
Perry	First Energy	8	5	10	18	16	59	15	17	26	26	17	19	13			249		249
River Bend	Entergy	31	5	11	18	18	11	26	18	17	11	18	24	36				244	244
ANO	Entergy	12	5	10	17	23	24	11	27	21	31	26	19	17				243	243
Fort Calhoun	Omaha PPD	11	6	20	14	15	22	18	19	19	14	29	23	25				235	235
Palisades	Entergy	9	20	14	13	10	11	27	20	28	15	19	32	15			233		233
Callaway	Union Electric	17	15	11	17	17	17	26	13	19	19	17	31	13				232	232
Grand Gulf	Entergy	4	13	11	7	10	13	14	30	26	24	14	27	30				223	223
Salem	PSEG	8	12	14	26	24	25	19	13	24	13	4	14	5	201				201
Waterford	Entergy	13	4	14	18	17	16	8	14	14	19	11	28	25				201	201
Byron	Exelon	8	10	10	19	14	23	14	13	20	12	20	22	14			199		199
Quad Cities	Exelon	28	5	20	16	11	10	30	13	14	17	9	15	11			199		199
Hope Creek	PSEG	15	14	25	19	25	17	19	20	12	15	9	5	3	198				198
Millstone	Dominion	26	15	13	8	12	24	19	14	15	15	16	9	10	196				196
Prairie Island	Northern States	15	1	6	5	11	16	14	10	15	29	26	26	21			195		195
Braidwood	Exelon	7	12	14	6	5	8	12	14	14	17	25	34	23			191		191
Columbia	Energy	8	12	7	23	18	14	10	18	11	18	8	18	26				191	191
Duane Arnold	NextEra	11	2	7	23	12	23	18	21	8	14	19	11	16			185		185
D.C. Cook	Indiana Mich.	24	11	27	25	5	17	14	11	9	6	6	2	17			174		174
Susquehanna	PPL	17	9	15	11	13	8	12	11	10	9	17	22	20	174				174
S. Texas Proj.	STP	11	12	12	24	16	12	9	16	8	13	14	15	11				173	173
Fermi	Detroit Edison	8	5	6	11	14	22	13	26	18	8	11	13	15			170		170
Comanche Peak	Luminant	7	6	11	5	11	13	11	8	19	15	17	28	13				164	164
Oyster Creek	Exelon	16	6	13	8	15	13	16	13	10	18	16	11	9	164				164
LaSalle	Exelon	9	9	14	8	13	22	16	24	5	6	13	11	13			163		163
Monticello	Northern States	9	12	9	12	13	11	9	11	18	14	10	18	14			160		160
Calvert Cliffs	Calvert Cliffs	13	18	7	6	20	6	11	13	12	18	16	8	11	159				159
Oconee	Duke	22	8	14	13	10	21	9	9	10	8	10	19	6		159			159
Clinton	Exelon	18	5	12	4	16	10	6	10	15	8	19	20	7			150		150
Nine Mile Point	Nine Mile Point	20	5	9	15	19	8	7	7	12	11	7	9	12	141				141
Three Mile Isl.	Exelon	9	17	10	8	14	14	9	10	6	13	11	5	14	140				140
Saint Lucie	Florida P&L	5	11	3	12	10	12	12	12	7	13	13	8	16			134		134
Browns Ferry	TVA	6	5	6	4	8	10	10	19	6	16	16	12	11			129		129
Farley	Southern	8	11	8	5	5	12	5	5	6	19	9	24	9			126		126
Watts Bar	TVA	5	5	13	10	8	10	8	9	9	8	11	14	15			125		125
McGuire	Duke	6	4	9	8	18	11	13	9	8	14	10	6	8			124		124
Summer	SCEG	13	10	11	12	11	10	9	6	8	3	4	15	12			124		124
North Anna	Virginia E&P	11	3	4	6	10	14	9	8	8	15	12	12	10			122		122
Pilgrim	Entergy	13	5		9	6	9	6	10	14	12	10	18	10	122				122
Sequoyah	TVA	11	10	15	9	7	5	9	7	7	8	5	14	15			122		122
FitzPatrick	Entergy	28	8	7	8	5	8	2	8	10	11	11	8	7	121				121
Turkey Point	Florida P&L	7	4	2	9	13	12	9	16	8	11	11	11	8			121		121
Beaver Valley	First Energy	11	11	10	10	8	11	8	10	7	6	6	12	9					119
Ginna	Ginna	8	3	11	16	9	10	12	7	9	12	5	8	8	118				118
Limerick	Exelon	10	10	11	16	8	5	5	4	8	10	7	8	11	113				113
Vermont Yank.	Entergy	16	8	9	10	14	3	5	6	12	7	9	7	6	112				112
Peach Bottom	Exelon	5	1	13	14	7	9	7	10	12	14	2	8	7	109				109
Surry	Virginia E&P	7	6	6	10	4	8	7	14	8	13	6	13	4			106		106
Catawba	Duke	12	6	8	8	4	10	11	17	4	5	8	4	8			105		105
Harris	Carolina P&L	10	3	5	6	5	8	4	12	8	8	11	15	10			105		105
Seabrook	NextEra	9	8	7	11	9	13	11	6	3	2	4	8	7	98				98
Brunswick	Carolina P&L	5	4	4	3	7	9	7	7	9	17	8	6	10			96		96
Hatch	Southern	6	8	8	5	3	5	7	7	4	10	9	7	13			92		92
Vogtle	Southern	4	3	10	7	7	4	3	9	6	5	5	7	10			80		80
Robinson	Carolina P&L	3	3	1	4	4	5	3	3	5	6	16	8	12			73		73
Totals by Year, Site, Region, & NRC		826	533	706	900	858	907	822	888	831	939	892	988	893	2,577	1,943	3,050	3,413	10,983

* Until recently Indian Point was staffed and inspected as two one-unit sites rather than as a single dual unit site. This biases the number of inspection findings for the site higher than would otherwise be the case.

The NRC agreed with GAO Recommendation 1 to conduct an analysis of the causes of the regional differences in the number of findings of very low significance (Green) and non-escalated violations (see GAO Audit Report, Appendix XI: Comments from the Nuclear Regulatory Commission).

The GAO analysis and recommendation were derived from NRC's Plant Issues Matrix (PIM) data reflecting the number of non-licensee-identified green findings and non-escalated violations. The remainder of this report documents the results of the staff's analysis, which includes an examination of causes that could influence the number of PIM findings. It should be noted that a finding is entered into the PIM only when the staff identifies a licensee performance deficiency, screens the performance deficiency as MTM, and then subsequently determines the MTM performance deficiency is not licensee-identified and Green.

TABLETOP EXERCISE

To facilitate analysis of the regional differences in the number of green findings and non-escalated violations, the staff conducted a tabletop exercise. Additionally, inspectors and supervisors from each region were solicited to provide perspectives on potential causes of the regional differences.

The staff developed the tabletop exercise and administered it to:

- Evaluate responses to scenarios developed from actual inspections.
- Gather insights into the potential causes of the regional differences.
- Examine individual and collective understanding and interpretation of the inspection manual.

The tabletop exercise included scenarios that sought to assess the way the regions:

- Implemented the MTM screening process (screen performance deficiencies to findings).
- Assigned identification (assigned licensee identification credit to findings).
- Identified and screened issues in scenarios related to selected inspection procedures.

Scenarios generally used multiple choice and text response to capture the participants' determination and reasoning. There were 56 participants who participated in the tabletop exercise, 53 of whom were from the regional offices. Considering the total regional staff population, the analysis team determined that viable conclusions could be drawn using this sample size. The participants included Division of Reactor Safety/Projects branch chiefs, team inspectors, and resident inspectors from each region. Three headquarters staff members also participated but were excluded from the analysis since they do not contribute to the observed differences in regional findings. Attachment 1 contains the raw data from the exercise. This analysis categorizes participant responses to reflect the regions as a whole. The accuracy of this analysis could have been improved by: (1) better randomizing the selection of participants to reduce potential bias, and (2) increasing the number of participants to get a more representative sample.

ANALYSIS

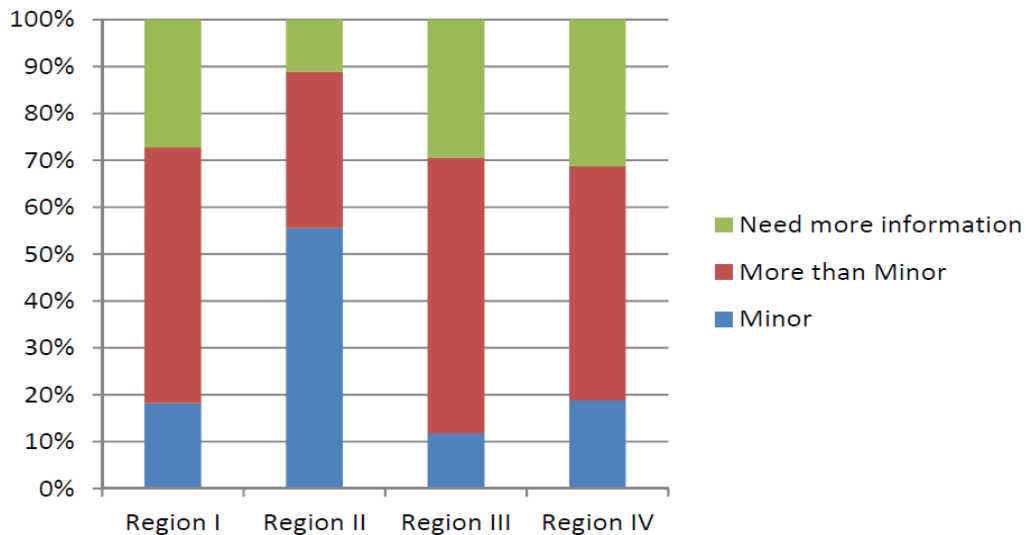
The focus of the tabletop exercise, individual solicitation, and the subsequent analysis was to identify potential causes of the observed regional differences in the number of green findings and non-escalated violations. It was not designed or intended to identify general program

effectiveness improvements. The following sections describe and illustrate some of the more notable differences observed in the regional responses to the tabletop exercise scenarios. In all cases, a team consisting of headquarters and regional personnel contributed to interpreting and analyzing the participant's responses and reaching conclusions.

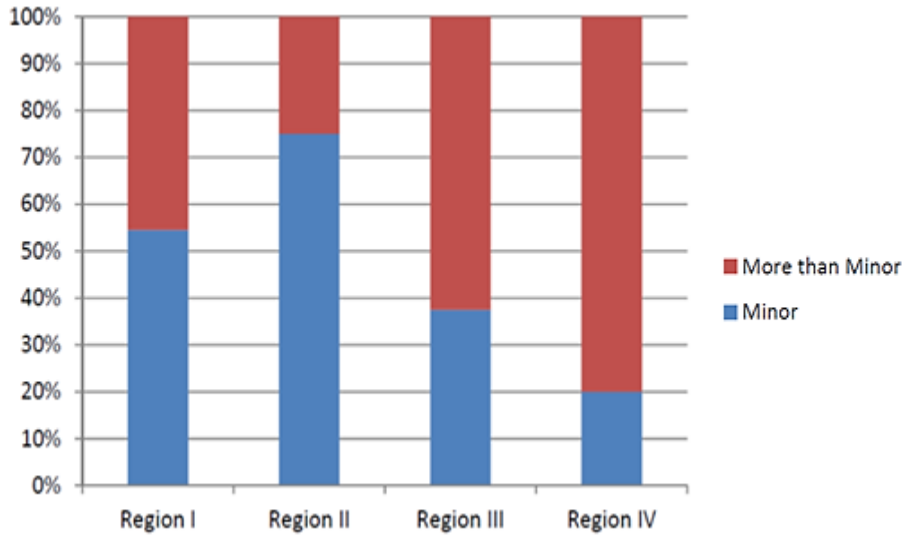
Regional Differences Observed in MTM Screening

A series of tabletop exercise scenarios examined the MTM screening process. Some tabletop exercise scenarios showed notable regional differences in MTM screenings and are shown in Figures 4 through 9. These exercise scenarios show participants following and interpreting the same program requirements and guidance differently to produce regionally different outcomes. These scenario results indicate that Region II was less likely than other regions to conclude that a performance deficiency was MTM. This result aligns with the data provided in the GAO report and in Figure 3. The tabletop exercise scenario results did not consistently show Region IV identifying more findings than Regions I and III. This could suggest that the number of green findings and non-escalated violations in Region IV is being influenced by other factors not directly related to MTM screening. Similarly, the tabletop exercise scenario results could not explain why Region I had fewer findings than Region II during the last few years. Differences in the MTM screening process are contributing to the observed regional differences in the number of green findings and non-escalated violations.

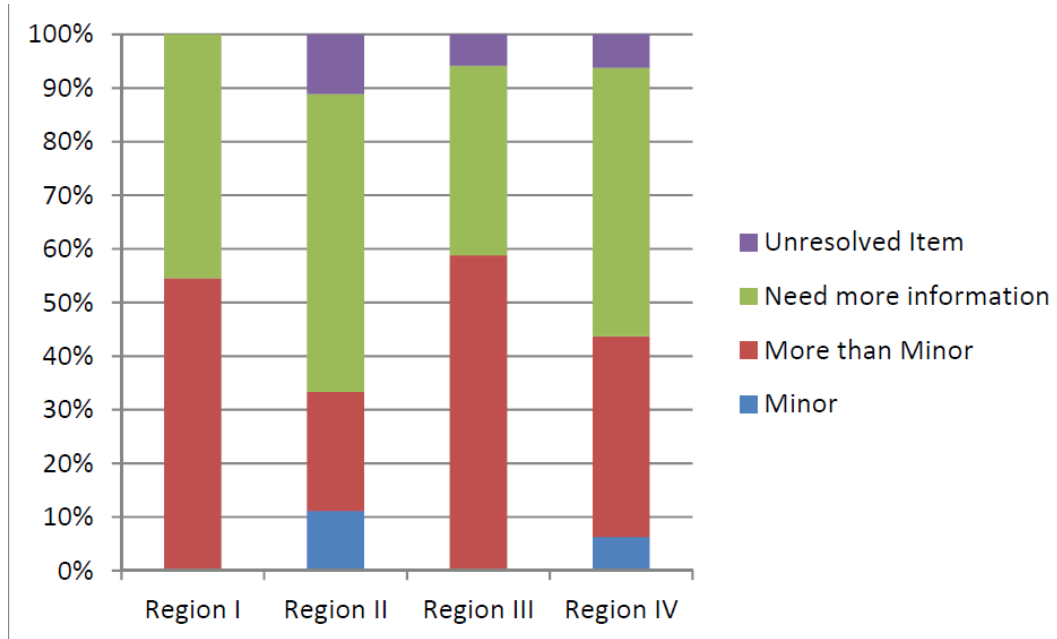
**Figure 4: Potential loss of operability later found to be operable
Exercise 4A (Question 34)**



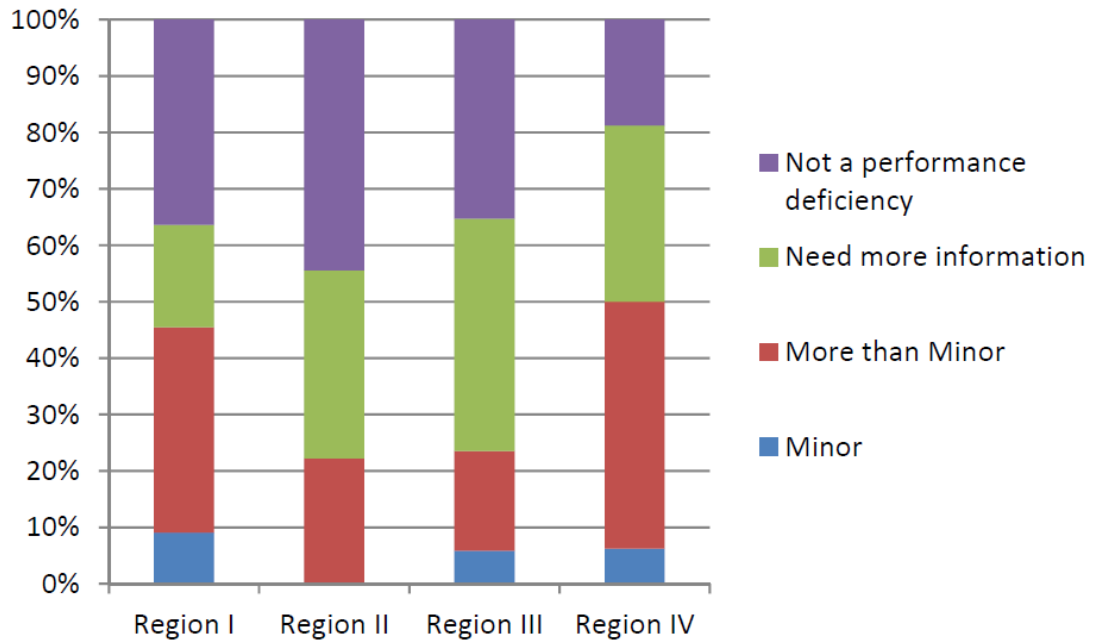
**Figure 5: Design calculation error
Exercise 7B (Question 74)**



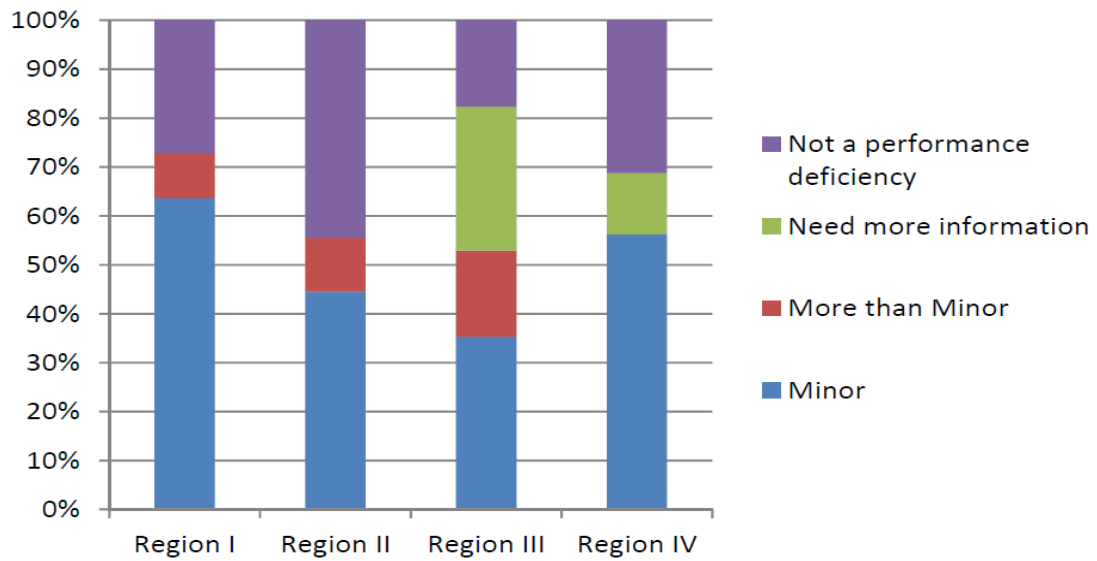
**Figure 6: Missed post-maintenance evaluation
Exercise 3 – (Question 30)**



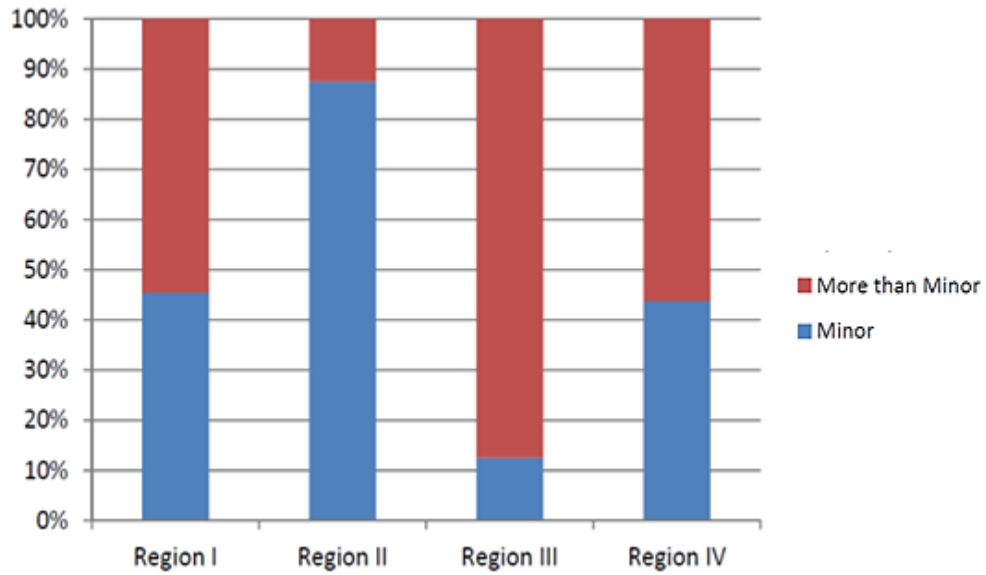
**Figure 7: Repetition of condition adverse to quality
Exercise 4B (Question 36)**



**Figure 8: Work in progress issue
Exercise 4C (Question 38)**



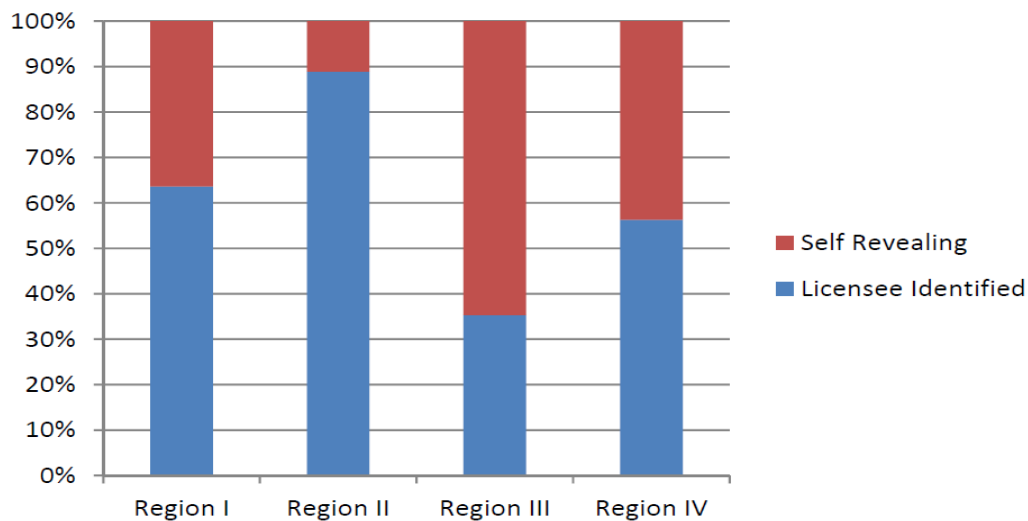
**Figure 9: Design qualification and operability
Exercise 6B (Question 61)**



Regional Differences Observed in Assigning Identification

Identification is an attribute assigned to a finding based on the definitions contained in Inspection Manual Chapter (IMC) 0612. The PIM does not capture green findings identified by the licensee. Thus, regional differences in assigning identification can influence the number of findings entered into the PIM. Tabletop exercise scenarios examined how participants assigned identification to findings. Figure 10 depicts a tabletop exercise scenario in which participants demonstrated notable differences in the way they characterized a hypothetical finding discovered during a surveillance test. This exercise scenario demonstrated that participants follow and interpret the same program requirements and guidance differently to produce regionally different outcomes. This tabletop exercise scenario indicated that Region II was more likely than other regions to conclude a finding was licensee identified, and therefore, exclude it from the PIM. This result aligns with the data provided in the GAO report and in Figure 3. However, the exercise scenarios related to assigning identification also showed Region IV was not appreciably less likely than Regions I and III to conclude a finding was licensee identified. This could suggest that the number of findings in Region IV is being influenced by other factors not directly related to the assignment of identification. Participants provided their reasoning for their determinations in the tabletop exercises. Some participants assigned licensee identification credit based on the fact that the finding was identified through an NRC required program. Others considered the problem to be self-revealing (e.g., require no active and deliberate observation) or considered the finding to be outside the scope of the surveillance. Differences in assigning identification are contributing to the observed regional differences in the number of green findings and non-escalated violations.

**Figure 10: Finding revealed during surveillance test
Exercise 1, Scenario 6 (Question 16)**



Inspection Procedures

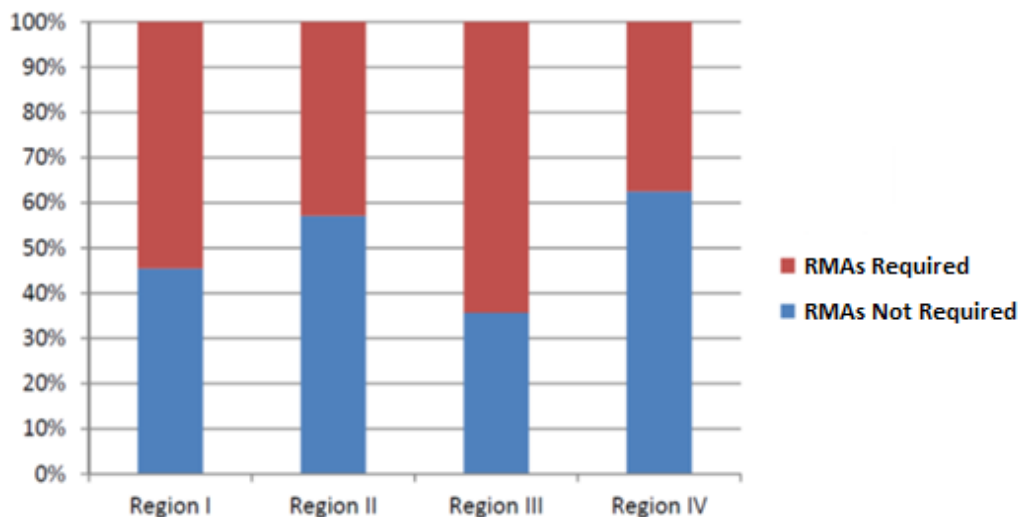
Operability Evaluations and Engineering Inspections (IP 71111.15 & IP 71111.21)

The scenarios related to inspection procedures 71111.15 and 71111.21 showed similar results to the MTM screening scenarios. The participants across the regions were consistent in identifying a performance deficiency in response to the scenario exercises related to these inspection procedures. However, there was a notable difference in whether the performance deficiency was considered to be more than minor. This can be seen in Figures 5 and 9 discussed in the “Regional Differences in MTM Screening” section. Participants provided their reasoning for their determinations (exercise responses) in the tabletop exercises. Many participants relied on lost design margin or loss of design assurance in determining whether a performance deficiency was a finding. Additionally, some participants relied on operability as a determining factor in establishing if the performance deficiency was a finding.

Maintenance Rule (IP 71111.13)

Maintenance rule (Title 10 of the *Code of Federal Regulations* (10 CFR) 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants”) scenarios revealed different levels of understanding of maintenance rule requirements. For example, there were different perspectives on which licensee activities trigger the 10 CFR 50.65(a)(4) requirement. The responses also revealed a different understanding of when risk management actions (RMAs) are required, as illustrated in Figure 11. The data from this tabletop exercise scenario did not correlate with the data provided in the GAO report and in Figure 3 for observed historic regional differences, making it less likely to be a significant contribution.

**Figure 11: Risk management actions required
Exercise 5A (Question 42)**



Requirements and Guidance

Responses to non-scenario-specific exercise questions that solicited participant opinion indicated that participants see differences in MTM screening as being the greatest influence on the regional differences in the number of findings, as shown in Figure 12, and that interpretations of the IMC 0612 screening procedure influenced MTM screening the most, as shown in Figure 13. The different interpretations and bases provided in the tabletop exercise scenarios also indicated that both the MTM screening process and the identification assignment are contributing to the differences seen in the number of findings. The tabletop exercise demonstrated how IMC 0612 requirements and guidance are being followed and interpreted, but applied differently to produce different outcomes.

**Figure 12: Degree of influence on Regional Differences
(Participant Opinion, Question 89)**

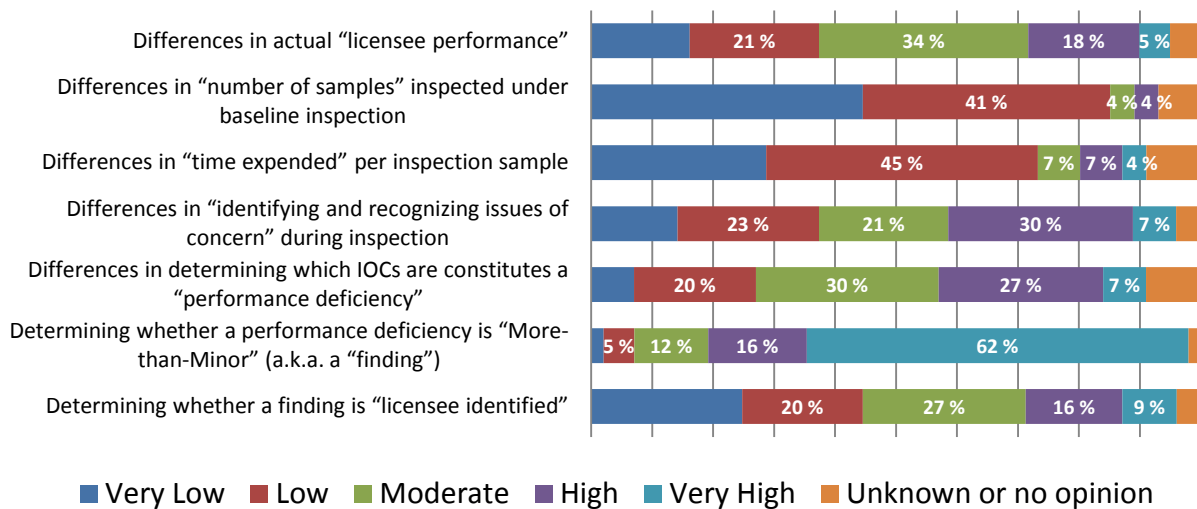
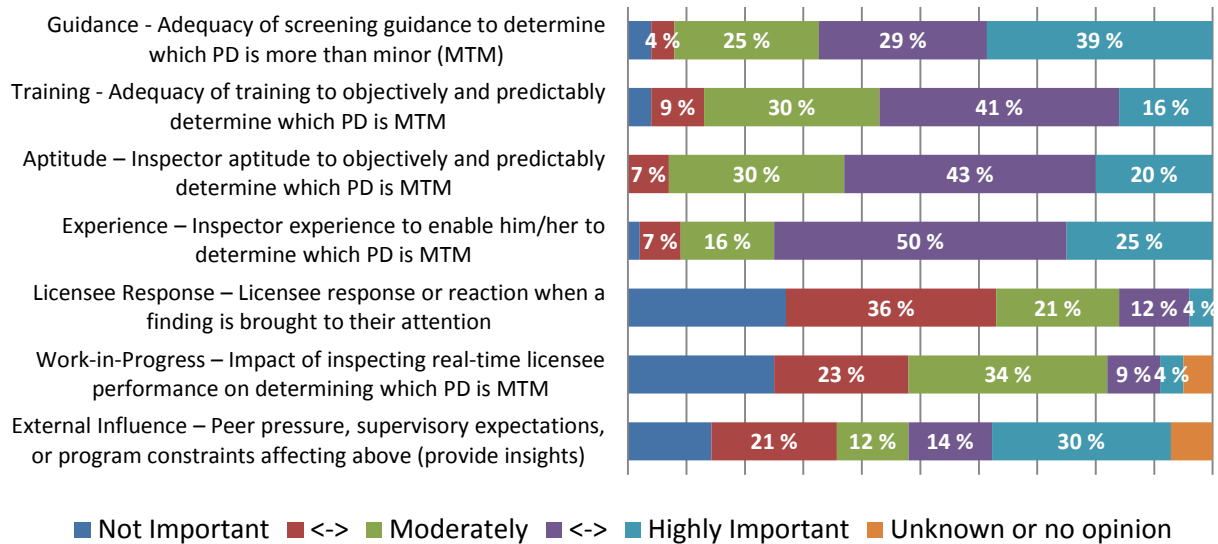


Figure 13 (Question 93) – Degree of influence on MTM Screening (Participant Opinion)



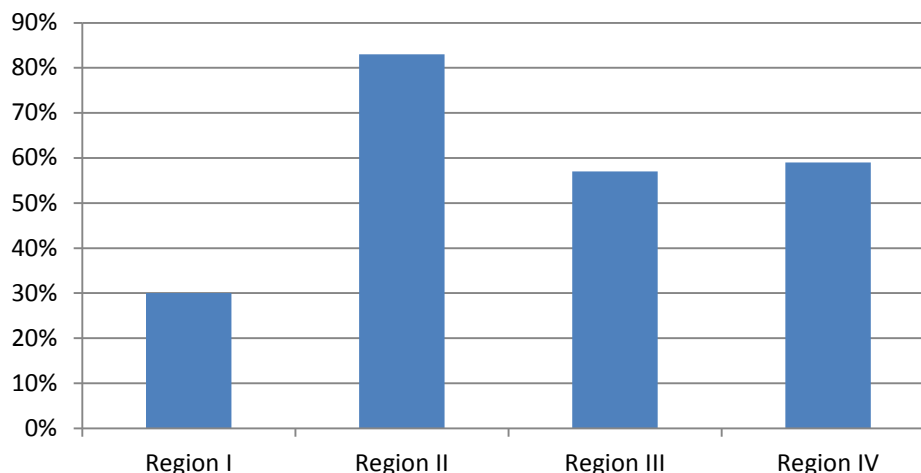
Experience

Participants perceived that individual inspector experience had a significant influence on MTM screening, as shown in Figure 13. However, a review of regional demographics from the 2013 Metric Report did not corroborate this perception. No clear correlation was observed between the regional differences in inspector experience and the regional differences shown in Figures 1 and 3.

Training

Participants perceived that training had a significant influence on the MTM screening process, as shown in Figure 13. Many participants generally indicated that they learned how to interpret and apply program requirements and guidance in their region through on-the-job training and interactions with other staff within their respective region. In addition, the analysis team noted that the training conducted in the regions during division meetings, seminars, and other “knowledge transfer” events was often regionally developed and was not always shared across regions or reviewed by headquarters. As such, the potential for inconsistent training exists. For example, Region I enforcement and allegation staff discussed the integration of traditional enforcement into the ROP at the spring 2013 Inspector Counterpart Meeting. As shown in Figure 14, Region I subsequently had the lowest success rate in responding to a traditional enforcement-related question. The results shown in Figure 14 do not correlate with data in Figure 3 but instead show evidence of a regional difference in ROP interpretation directly related to training. Regional differences in ROP understanding were also demonstrated in the exercise scenarios related to MTM screening and assigning identification. These regional differences suggest that regional differences in training or lack of training (formal and informal) exist and that they are contributing, in part, to the differences seen in the number of green findings and non-escalated violations.

Figure 14: Percentage of participants who correctly identified that a performance deficiency associated with traditional enforcement must be screened through IMC 0612 (Past Training Topic) (Question 101, Item 2)



Fleet-Operated Sites

The GAO performed some preliminary analyses of the reasons for the regional differences in the number of findings, starting on page 28 of their report. One notable consideration they explored was that the regional differences could possibly be attributed to the number of fleet-operated sites in each region. The staff reviewed PIM data and generally noted that fleet-operated sites did not receive more or fewer findings within any particular region (See Figure 3).

Other Postulated Causes

Prior to conducting this study the analysis team re-examined the analysis performed by the GAO with regard to (1) number of hours spent inspecting reactors; (2) amount of time reactors are under increased oversight as a result of performance deficiencies; and (3) age of reactors. The analysis team concluded that the GAO's analysis was correct and that these factors did not significantly contribute to the observed historical regional differences in the number of findings and non-escalated violations.

Other Influences

Most participants provided their opinions on other possible causes that could have affected the number of green findings and non-escalated violations identified by their region staff during the tabletop exercises. The following were some of the more common themes:

- Regions have developed varying approaches over time to implementing certain program requirements, guidance, and training, which tend to influence inspector and branch chief judgment (e.g., MTM determination with respect to operability and margin, identification assigned with respect to surveillance testing).

- Regions have developed their own practices and beliefs affecting outcomes (e.g., expectations that “better” inspectors should produce more findings, beliefs that green non-cited violations have no regulatory value or safety impact and therefore are not worth documenting because the licensee’s corrective action program should address the problem).

Based on a review of the tabletop exercise comments, the analysis team judged that some differences in the number of findings are most likely caused by differences in ROP practices and implementation within each region. These different practices could reasonably explain why Region IV has historically identified more findings. The team also determined that there are differences within each region most likely because of differing management interpretations have emerged to compensate for lack of clear program guidance. Although not specifically a cause of the region differences, these differences within a particular region show that some individual inspectors and branch chiefs may develop their own general approach when more specific direction is not provided.

Self-Assessment

The magnitude of and reasons for the regional differences in the number of findings were not well understood before this study. The ROP self-assessment process defined in IMC 0307 does not specifically require the number of findings generated by each region to be compared for consistency and for the causes of the differences to be understood and assessed.

CONCLUSION

The staff conducted a tabletop exercise and solicited perspectives on the regional differences in the number of green findings and non-escalated violations with the objective of identifying the possible causes for these differences. Following a detailed analysis of the results, the analysis team identified two top influencing causes:

- Some program requirements and guidance that can be followed and interpreted differently to produce different outcomes
- Different regional practices affect ROP implementation methods and outcomes

The analysis team identified that the ROP self-assessment process did not seek to evaluate the consistency with which regional offices identify, assess and document green findings or non-cited violations and considered this be a contributing factor.

The analysis team concluded that certain enhancements could improve ROP objectivity and predictability associated with inspection findings of very low safety significance. Potential enhancements include procedure changes, standardized training, management awareness briefings, and augmented self-assessment activities.

LIST OF REFERENCES

[Raw Tabletop Exercise Data \(ADAMS No. ML14052A436\)](#)

[2013 Metric Report \(ADAMS No. ML14056A229\)](#)