ROP Resource Analysis

In fiscal year (FY) 2002, the total staff effort expended for the Reactor Oversight Process (ROP) continued the downward trend that was seen during the first two years of implementation.[1]

Table 1 provides a comparison of staff resources expended during three separate annual time periods: the first year of implementation, FY 2001, and the more recent numbers for FY 2002.

A comparison of FY 2002 with FY 2001 shows a reduction of nearly 10% in the staff hours expended for the ROP. The reduction is evident in all elements of the ROP except for plant specific/supplemental inspections and safety issues inspections. The bulk of the reductions occurred in baseline inspection activities. Although some of these reductions may reflect efficiency gains, a number of events during the calendar year (CY) 2002 inspection cycle challenged the ability of the Nuclear Regulatory Commission (NRC) to complete the required baseline inspections. These challenges required regional staff to implement short-term coping strategies that resulted in reduced baseline inspection effort.

The reduction in the number of resident inspectors that resulted from implementation of the "N+1" to "N" resident inspector staffing policy was one of several contributors to the challenges that the Regions struggled with to complete the baseline inspection program in CY 2002. With full implementation of the "N" resident inspector staffing policy in CY 2002, some unexpected resource problems have emerged. Regional offices are having difficulty in maintaining site coverage requirements and satisfying the baseline inspection program requirements assigned to the resident inspectors. This problem becomes magnified whenever there are unexpected losses of qualified inspectors, or if there are emergent resource demands, such as with Davis-Besse and the security orders.

The staff underestimated the impact that resulted from the change in the resident staffing policy. The full impact of the change was only recently recognized since "N" resident staffing was achieved gradually and concurrently with implementation of the Reactor Oversight Process in combination with higher than expected attrition of inspectors. The operational margin that the N+1 staffing policy provided with its additional resident inspector has eroded and several regions did not have sufficient qualified inspectors to complete the baseline program as intended. There are other interrelated factors that contributed to the resource challenges that the Regions struggled with in CY 2002; some of the more significant are discussed in the sections that follow.

The reverse trend in plant specific/supplemental inspections is attributed primarily to a greater than anticipated inspection effort resulting from inspection findings and performance issues and the effort required for restart inspections at Davis-Besse in accordance with Inspection Manual Chapter (IMC) 0350, "Oversight of Operating Reactor Facilities in an Extended Shutdown as a

[1]The ROP is implemented on a calendar year basis; however, resource data were obtained and reported on a fiscal year basis in order to meet the schedule requirements of this paper. There is no basis to believe the results would be significantly different if resource data were collected on a CY basis.

Result of Significant Performance Problems." The increase in safety issues inspections reflects the increased activity in this area in FY 2002 compared with FY 2001.

Resource Model

The resource model developed from data and experience gained during ROP initial implementation was used to estimate regional inspection resource requirements and was used as the basis to initially develop budget requirements in the FY 2004 budget. The total FY 2002 actual expenditures compare favorably with the resource requirements estimated by the current resource model (approximately 300 full time equivalents (FTE)); however, this favorable comparison must be tempered with the fact that a number of events in the CY 2002 inspection cycle, as described later in this attachment, challenged the ability of the NRC to complete the required baseline inspections. Because of these events, CY 2002 cannot be considered a representative year for the purpose of resource analysis. However, experience in CY 2002 demonstrates that additional refinements to the ROP resource model are needed to reflect actual and expected program needs. The primary changes that were evaluated are the inclusion of IMC 0350 inspections and increased supplemental inspections. The refinements to the resource model will be made using the additional experience gained in CY 2002 and as more data become available.

The lower baseline expenditures during this past inspection cycle will not necessarily result in equivalent reductions in baseline resources since the same factors that challenged the agency's ability to complete the baseline inspections also account for the reduced baseline inspection hours. Further discussions of circumstances related to the execution of the baseline inspection program during the CY 2002 inspection cycle are provided in subsequent paragraphs.

Efficiency Focus Group

The ROP Efficiency Focus Group, a focus group consisting of experienced staff from the regions and the Office of Nuclear Reactor Regulation (NRR), was formed in November 2001 to explore ways in which to achieve efficiency gains in the ROP. After evaluating a number of ideas, the focus group selected two suggestions for near-term implementation: (1) explore less resource-intensive alternatives to the annual performance assessment meeting for plants in the licensee response column of the Action Matrix, and (2) review the baseline inspection procedures to identify areas where consolidation is possible.

The staff is actively pursuing both of these suggestions. The staff is considering reducing the frequency of the performance assessment meeting with licensees from annual to biennial, with an option for an annual meeting if appropriate for selected sites—at the request of the licensee or at the discretion of regional management—for plants in the licensee response column of the Action Matrix during the entire assessment period.

The suggestion to consolidate the baseline procedures has been undertaken initially for four groups of procedures and will be implemented in a six-month pilot starting in April 2003. If the anticipated resource savings are realized, assuming effectiveness is maintained, the baseline procedure consolidation effort will be extended to other baseline procedures.

Challenges Confronted in CY 2002 Inspection Cycle

The major component of the ROP is the baseline inspection program, which is performed at all reactor sites by NRC resident inspectors and inspectors from the regional offices. During the CY 2002 inspection cycle, regional offices indicated that they were seriously challenged in their ability to complete the baseline inspection program. The projected inability to complete the baseline inspection program at all reactor sites was attributed to two primary factors:

- a shortage of qualified inspectors
- the diversion of inspection resources intended for baseline inspections in order to respond to unanticipated emerging events and external demands.

Although Regions II and IV indicated that they were challenged in managing inspection resources, they expected to complete the baseline program at all sites. The inability to complete baseline inspections was a concern primarily in Regions I and III because of circumstances and unusual demands related to events at Indian Point 2 and Davis-Besse, respectively, and in some cases, the high turnover of qualified staff due to promotions, reassignments, and retirements.

Shortage of Qualified Inspectors

Even though the inspection resources for the baseline inspection program are adequately budgeted to complete baseline inspections at all reactor sites, regional offices experienced a significant shortage of qualified inspectors in CY 2002. Regional assessments indicate that, although the nature and degree of the events that led to the shortfall of qualified inspectors differ among the regions, there are a number of common elements to which the shortage can be attributed:

(1) Staff turnover due to promotions to Headquarters and internal region reassignments
Region 1 reported that, over the course of little more than one year, more than 40 individuals in reactor programs have been promoted or reassigned, have retired, or have had significant rotations.

(2) Inspection staff vacancies due to difficulty in hiring experienced inspectors and the seven-year resident rotation policy
The unavailability of fully qualified inspectors increases the training burden associated with staff turnover. In addition, security considerations have increased the time required to process security clearances to the point where a security clearance becomes a major factor in fielding an inspector for unescorted access.

(3) The agency policy requiring at least 25% of new hires to be recent graduates with resulting high training burden and delay in inspector certification
Although new hires may be highly talented, they need time to qualify as and develop into effective inspectors. It takes on the average two years to achieve full qualification for new graduates. At the end of FY 2002, 82 of 381 inspectors (21.5%) were in the qualification process. By replacing fully qualified inspectors with new hires, the overall regional inspection efficiency is reduced in the short term.

(4) The impact of the N+1 to N policy has resulted in decreased inspection efficiency and staff shortages

The transition from the “N+1" to “N” resident inspector policy resulted in 35 inspector positions moving from resident sites to the regional offices; however, very few inspectors actually moved to the regional offices, leaving those positions to be filled. Also, the inspection efficiency is greater for resident inspectors compared with regional inspectors. For the 35 positions, the loss of efficiency is equivalent to 8 inspectors. A more detailed discussion of the impact on ROP of the “N+1" to “N” policy is provided later in this attachment.

Diversion of Inspection Resources

The other factor that contributed to the challenges in CY 2002 is the diversion of inspection resources to respond to unforseen emerging events and external demands. Several events during the past year resulted in diversion of inspection resources at the expense of baseline inspections:

(1) The agency response to the events of September 11, 2001, resulted in reduced inspection effort in order to provide incident response. A number of baseline inspections were rescheduled resulting in increased burden during the CY 2002 inspection cycle. The events of September 11, 2001, also resulted in security and emergency preparedness issues (with subsequent increased inspection) and increased public communication and response to public inquiries.

(2) More supplemental inspections than anticipated were required as a result of inspection findings and performance issues at Cooper, Oconee and other sites.

(3) There were significant resource expenditures for public outreach efforts at Davis-Besse and Indian Point to address the events and concerns at those sites.

(4) There was an unanticipated inspection effort to support the IMC 0350 restart activities at Davis-Besse.

(5) Significance Determination Process (SDP) evaluations were more resource intensive than anticipated.

(6) Continuing emergent issues in the safeguards area impacted resident and regional inspectors’ time.

The effort required to support these activities resulted in fewer inspectors available to perform baseline inspections.

Short-Term Coping Strategies

Regional staff implemented a number of strategies to address and avert the possibility of not completing the baseline inspection program in CY 2002:

(1) Manage regional resources more aggressively (rehire annuitants and delay personnel moves, mandate/encourage moderate use of overtime, defer retirements, use project

engineers and basic qualified inspectors to the extent possible, make maximum use of regional staff to supplement inspectors, reduce/defer non-required training, cross train inspectors to increase inspector areas of expertise so that the same inspectors can perform inspections in several areas)

(2) Defer and cancel inspector counterparts meetings
(3) Delay biennial/triennial inspections to the next inspection cycle
(4) Increase use of contractors to the extent permitted by funds and inspection requirements
(5) Reduce inspection effort to the minimum required for satisfactory completion of inspection procedure (inspect the smallest sample size allowed by the procedure)
(6) Defer regional improvement and development initiatives, including Efficiency Focus Group efforts, into CY 2003
(7) Share inspection resources among regions to provide stop-gap assistance

Even with aggressive use of these short-term coping initiatives, Regions I and III estimated that they would experience a shortage of inspection resources of 9 inspector-weeks and 46 inspector-weeks, respectively. The shortfall was supplemented with assistance from inspectors from other regions and headquarters.

With these additional resources, the regions were able to complete the CY 2002 baseline program. The potential long term impact on plant safety of continuing some of these coping strategies (i.e. minimum procedure samples and effort, reduced inspection preparation time, deferment of some inspections, etc.) if done year-after-year, could erode the staff's ability to obtain adequate indication of licensee performance and to identify risk-significant issues.

Impact on CY 2003

Although the short-term coping strategies allowed completion of the baseline inspections in CY 2002, the deferrals and postponements of a number of activities will have adverse impact on the conduct of the CY 2003 inspection program. The currently known impacts are:

(1) *Inspections rescheduled from CY 2002 to CY 2003*
A number of biennial and triennial inspections were deferred until CY 2003 to make inspection resources available in CY 2002, resulting in more inspection resources needed in CY 2003 to accommodate the deferred inspections. This is particularly acute in Region III due to the delay of 11 inspections into CY 2003.

(2) *Delayed inspector training and qualification*
Deferral of inspector qualification training in CY 2002 to permit use of "basic" qualified inspectors in completing CY 2002 baseline inspections will delay inspectors from reaching full qualification, which in turn impacts the number of fully qualified inspectors in CY 2003.

(3) Deferred improvement/development efforts
The regions provide support for several program improvement initiatives (e.g., the Mitigating Systems Performance Index (MSPI), Problem Identification & Resolution Focus Group, Efficiency Focus Group (EFG), and Fire Protection SDP Initiative). Participation in program improvement activities for CY 2002 was reduced and may be reduced in CY 2003 in order to

complete required inspections. Resource constraints have resulted in delays in some program improvements, such as further performance indicator development and EFG activities.

(4) Deferred inspector counterpart meetings
A high value is placed on regional inspector counterparts meetings. Postponement of these meetings from CY 2002 to CY 2003 may result in fewer inspection resources available in CY 2003.

(5) Impacts from Davis-Besse
Fallout from Davis-Besse lessons learned is resulting in additional inspections. The impact of Davis-Besse on the ROP is being evaluated. Also, as Davis-Besse restart continues to be delayed, restart inspections in CY 2003 add significantly to the CY 2003 inspection burden.

(6) *Inspection oversight at specific sites*
Additional resources are needed for accelerated restart activities for Browns Ferry Unit 1, increased oversight of plants with performance issues, and reactor vessel head inspections and replacements.

(7) *The impact of safeguards activities on resident and regional inspectors*
Emergent safeguards inspection requirements place additional demands on limited inspection resources. Current resources allocated for safeguards/homeland security issues do not provide for the efforts of resident inspectors and region-based inspectors (such as emergency preparedness specialists, operations specialists, and, to a lesser extent, engineering inspectors) who support homeland security issues and spend time gathering data, validating information, and providing communication support. The safeguards inspections have a significant impact on the ability of the inspection staff to complete required inspections.

While no major changes to the ROP are anticipated in CY 2003, some adjustments will be required to address these issues and to accommodate the additional inspection effort and attention that must be given by the regional offices to external stakeholders for plants in the IMC 0350 process, plants with high profile public issues, such as those at Indian Point, plants with multiple degraded cornerstones, and situations where contentious security issues are present. The staff is considering implementing the following actions to provide relief during the CY 2003 inspection cycle:

(1) Provide additional resources as determined by an add/shed process.
(2) Continue aggressive human resource management to avoid staffing shortfalls. Ensure timely detection and trending of changes to qualified inspectors, prompt filling of vacancies, and active recruiting and training of new hires.
(3) Develop a surge capacity of qualified inspectors in NRR and the regions to be called upon to supplement regional inspectors when needed.
(4) Request funding above original regional estimates to increase use of contractors and allow specific regional inspection expertise to be applied where it is needed.
(5) Evaluate changes to the agency policy which would allow resident inspector positions to be “double-encumbered” for up to a year ahead of expected RI transfers to minimize the impact from such transfers.

Possible Long-Term Improvements

Although the coping strategies described above provided temporary relief, in many instances the solutions have leveraged future use of resources. The FY 2004 and later budget requests have been revised to include inspection resources to support an IMC 0350 site and the need for supplemental inspection resources to assist in post-inspection oversight activities. Additional long-term options to prevent future difficulties include:

(1) Continue efforts to identify areas for possible efficiency gains in the ROP, including evaluation of the effectiveness of the ROP procedures and the effort to streamline the SDP process/Phase 2.

(2) Reevaluate the allocation of baseline inspection procedures between the resident and regional inspector staff.

(3) Reconsider personnel staffing policies to permit “overhiring” above minimum estimated requirements (i.e., increase inspection staff by 5-10 additional inspectors above requirement to compensate for expected turnover) in order to maintain a ready pool of qualified inspectors. “Double encumber” resident inspector positions.

(4) Continue aggressive hiring strategies by all four regions to avoid staffing shortfalls.

(5) Pursue and evaluate credit for licensee self-assessment. However, care will have to be given to the need to assure public confidence in the process, as well as to NRC's ability to independently and adequately assess licensee performance.

These options will be reviewed and evaluated as part of the ongoing, continuing ROP improvement process.

Impact on ROP from “N+1" Policy Change

Background:

The agency proposed to transition to the “N” resident inspector staffing policy in SECY-99-227, “N+1 Resident Inspector Staffing Policy,” in September 1999. The proposal was approved by the Commission in January 2000.

The purpose of the transition to “N” was to allow the regions more flexibility in conducting core and reactive inspections by increasing the inspector staffing level in the regional office. This would allow regional management the ability to allocate inspection resources (aka “reactive inspections”) to sites that needed them. The concept was that those 35 inspectors who were filling the “N+1" site would return to the regional office and assist the regions in conducting inspections. It was thought that number of qualified inspectors in the regions would increase by 35.

At the same time the staff was proposing a change to the resident inspector staffing policy, the staff also developed the ROP:

- SECY-99-007 “Recommendation for Reactor Oversight Process Improvements” (January 8, 1999)

- SECY-99-007A “Recommendations for Reactor Oversight Process Improvements” (March 22, 1999)

- Pilot Program: May 1999 to Nov 1999 at 8 plants

- SECY-00-0049 “Results of the Revised Oversight Process Pilot Program”

Data:

- Thirty-five FTEs were transferred to the regional office from the resident inspector program. The breakdown by region was as follows:

  Region I: 8
  Region II: 13
  Region III: 8
  Region IV: 6

  Total: 35

- Region Direct FTEs funded by NRR have declined since 1998:

  1998 - 425
  1999 - 401
  2000 - 392
  2001 - 386
  2002 - 381
  2003 - 374

- Available productive hours for conducting inspections are greater for resident inspectors than region-based inspectors:

  - Regional inspectors: 996 hours/region-based inspector
  - Resident inspectors: 1283 hours/resident inspector

- The Inspection Program did not lose any inspection resources in the transition from “N+1" to “N”. However, there was a loss in efficiency with the movement of resources from the resident sites to the regional offices as discussed in the analysis section.

- The current resource model used by the program office to budget inspection resources does account for individuals who are in the training pipeline. The staff does this by including all regional inspection staff in calculating inspector efficiency.

- The staff currently uses the average of the 5-year period from FY 1996 - FY 2000 to determine the overall inspection efficiency (i.e., 1140 hours/inspector). This number, however, does not reflect recent changes in regional personnel.

- June 2002 inspector demographics (all inspectors) indicate that we have 82 of 381 inspectors in the qualification pipeline. This represents 21.5% of the budgeted inspection force not fully qualified to conduct inspections. It should be noted, however, that some of the 82 inspectors may have achieved some basic level of qualification; however, the primary focus of new inspectors is full qualification rendering them largely unavailable for inspection activities until they achieve full qualification. This is particularly true for new graduates.

- The inspection program has been operating closer to "N" than "N+1" for some time. Most multi-unit sites had "N" resident inspectors during the first two cycles of the ROP.

	April 2000 - April 2001 (1st yr ROP)	April 2001 - Dec 2001 (2nd year ROP)	
	August 2000	June 2001	July 2002
Sites at N	22 (63%)	27 (77%)	33 (94%)
Sites at N+1	13 (37%)	6 (23%)	2 (6%)
net change	14%	17%	

- Baseline inspections were completed satisfactorily during the first two cycles of the ROP at all plants.

- The policy to require 25% of new hires to be at an entry level position will lower the overall program inspector efficiency.

- Resources required to complete baseline inspections have decreased since the initial implementation of ROP:

1st year of ROP	FY 2001	FY 2002
4/2/00 - 4/1/01	9/24/00 - 9/22/01	9/23/01 - 9/21/02
288,133	285,748	255,497*

  * This may be an under-representation of the hours required to complete the baseline inspection program in the third year of ROP since some inspections were deferred as a result of the events of September 11, 2001, and other events in 2002.

- Using the inspection hours estimate, it appears that the hours required to complete the ROP do not justify placing an extra resident inspector at multi-unit sites; however, some sites are unique -- an exemption was granted to Nine Mile Point, and multi-unit sites with significant differences between the units may need special consideration.

Analysis:

- Implementation of the "N" resident inspector policy resulted in some loss of inspector efficiency.

- The available productive hours for resident inspectors (1283) is greater than for region-based inspectors (996). When the staffing went from "N+1" to "N" resident inspectors, the inspection program did not recognize the change in efficiency between resident and region-based inspector resources. As a result, the 35 FTE transfer to region-based effort translated to only 27 FTE (a loss of 8 effective FTE).

  (996/1283)*(35) = 27 inspectors

- Challenges faced by the regions in completing the baseline during the third year of the ROP appear to be influenced more by the loss of qualified inspectors (high number of personnel transfers during CY 2002) than by other factors. The other factors which are exacerbating the current situation include:

  - "N" resident policy
  - requirement to hire personnel at entry level
  - response to 9/11
  - more resources devoted to unexpected events (Davis-Besse)

- The resources budgeted to complete the baseline inspections appear to be adequate. This, however, needs additional review due to an increase in supplemental inspections during ROP-3.

- Detection and trending of changes to the number of qualified inspectors in the regions are required.

- Inspector productive hours reflected in the budget model are based on average productive hours for all inspectors during the five-year period of FY 1996 - FY 2000. However, possible losses in efficiency due to recent changes in the inspector workforce are not reflected in these numbers.

- The minimum level of inspectors needed to complete the ROP may have been reached. Any further reduction in the number of inspectors may impose significant challenges to the regions' ability to complete the ROP along with other tasks assigned to them (continued ROP development, Temporary Instructions (TIs), etc.) unless efficiencies are implemented.

In addition to the above, one issue specific to Region I will also be addressed: In the current resource model, Millstone, Unit 2 and Unit 3, are treated as two single-unit sites instead of one dual-unit site. This treatment allocates additional inspection resources to Millstone in order to address unique site features as well as historical circumstances that are currently being resolved. Region I has indicated that it will reevaluate the need for these additional resources concurrently with its review of Millstone resident inspector assignments. In consultation with

Region I, a decision on the site status and inspection resource needs for Millstone will be made during the CY 2004 inspection cycle.

A similar situation exists for Indian Point, Units 2 and 3—currently treated as two, single-unit sites. The site status of the Indian Point units will also be reevaluated as consolidation of the two units under a single licensee continues; however, this is a long term reevaluation. The current public outreach demands for Indian Point do not justify a near term reduction of inspection resources for these units.

Table 1

Resources Expended
(Total Staff Effort Expended at Operating Power Reactors)

	52 weeks initial implementation 4/2/00 - 4/1/01	52 weeks FY 2001 9/24/00 - 9/22/01	52 weeks FY 2002 9/23/01 - 9/21/02
Baseline/Core			
Direct Inspection Effort	128,447	130,330	119,884
Inspection Prep/Doc	115,935	109,227	91,385
Plant Status	43,751	46,191	44,228
Subtotal	288,133	285,748	255,497
Plant Specific Inspections			
Direct Inspection Effort	11,295	8,436	9,354
Inspection Prep/Doc	6,683	6,161	7,715
Subtotal	17,978	14,597	17,069
GSI/SI	2,416	918	1,718
Performance Assessment	21,017	19,845	17,293
Other Activities	47,190	49,471	43,627
Inspection Related Travel			
Routine Communication			
Regional Support			
Enforcement Support			
Significance Determination Process			
Review of Technical Documents			
Total Staff Effort (regular + nonreg hrs)	376,734 hrs	370,579 hrs	335,204 hrs
Total Staff Effort/Operating Site	5,623 hrs/site	5531 hrs/site	5003 hrs/site