May 3, 1977

UNITED STATES
NUCLEAR REGULATORY COMMISSION

SECY-77-138A

CONSENT CALENDAR ITEM

For: The Commissioners

From: Ernst Volgenau, Director, Office of Inspection and Enforcement

Thru: Executive Director for Operations

Subject: NRC INSPECTION ALTERNATIVES

Purpose: To recommend a revised inspection approach that places inspectors full time onsite.

Category: This paper covers a major policy issue.

Issue: Should the NRC adopt an inspection program that when fully implemented will assign resident inspectors at reactor sites under construction, in test and in commercial operation and at other selected major licensee facilities?

Alternatives: An analysis of five inspection alternatives that involve resident inspectors is provided in the enclosed Study Report, NRC Inspection Alternatives. These alternatives are:

1. The present inspection program with inspectors based at the five Regional Offices.

2. NRC inspectors located in close proximity to, and inspecting clusters of sites. The inspector receives technical support from the Regional Offices, and additional unannounced inspections are conducted by special inspection teams.

3. NRC inspectors based full time at each reactor site with a construction permit or an operating license, and at other selected major licensed facilities. When fully implemented, more than one inspector may be located at a reactor site depending on the mix of activity or number of reactors at a site. The Regional Offices provide periodic technical support, and additional unannounced inspections are conducted by special inspection teams.

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4. The same as alternative 3 for reactors under construction and in preoperational testing but continuous NRC inspector presence for operating reactors.

5. The same as alternative 3 with the addition of inspectors located continuously in the control room of operating reactors.

Discussion: The NRC inspection philosophy is founded on the principles that the licensee is responsible for safe construction and facility operation and that the appropriate role for NRC is to assure that this responsibility is discharged. Each of the alternatives preserves this philosophy.

The current NRC inspection program has evolved over the past twenty years as the nuclear industry, safety technology and safety awareness of the public have grown. This program reflects the belief that safety cannot be inspected into a plant. Rather, safety is viewed as the result of conservative design, quality people and good management. To assure that these elements are maintained, the NRC inspection program emphasizes control by the licensee through quality assurance programs and systems, rather than direct NRC acceptance of components and hardware systems. This program has been carefully derived, is time tested and provides reasonable assurance that public health and safety are protected.

The current program is implemented by inspectors or teams of inspectors, operating from the five Regional Offices, performing periodic inspections at the licensee sites. About 25% of an inspector's time is spent conducting onsite inspections. Most of the remaining time is spent in the Regional Offices preparing for inspections, evaluating inspection results, and documenting inspection findings. The approach must place considerable confidence in records to assess the activities of the licensee, because onsite time and the opportunity to directly verify licensee activities are limited.

A two year trial inspection program, initiated in 1974, stationed two NRC inspectors close to two sites each to investigate the feasibility of the resident inspection concept. The evaluation of this trial program concluded that the concept of resident inspectors is viable because it can provide a number of benefits, principally involving the efficient and effective use of an inspector's time. (SECY 77-138.) Based upon the trial program experience, IE believes that the current region-based inspection program can be improved by increasing NRC inspector presence on site. This would provide:

1. Increased NRC knowledge of conditions at a licensed facility and a better technical base for regulatory action.

2. Lessened reliance on the accuracy and completeness of licensee records by improving the inspector's ability to independently verify licensee performance.

3. Additional assurance that licensee management control systems are effective and that licensee performance is acceptable.

4. Improved NRC posture relative to incident response.

Table 1 summarizes the IE manpower and dollar requirements and the onsite presence for each alternative in FY 81.

Table 1 Summary Data - FY 81

	Alternative				
	1	2	3	4	5
Total IE Manpower	925	1098	1147	1410	1784
IE Dollars (Millions)	43.1	51.3	55.4	66.9	80.5
Onsite Hours (Thousands)	175	220	375	825	1320

The pros and cons of each alternative are summarized below:

Alternative	Advantages	Disadvantages
1	. Carefully derived, time tested program.	. Limited onsite tim . Limited direct observation/measur ment. . High reliance on records.
2	. 25% more onsite time for sites involved. . Direct observation/ measurement doubled.	. Possibility of los of inspector objec tivity. . Uneven allocation of inspector resources. . Costs 20% more.
3	. Over 100% more onsite time for all sites. . Direct observation/ measurement increased by factor of 8. . High inspector utility.	. Costs 30% more. . Greatest possibili of loss of objecti ity.
4	. Nearly 400% more onsite time for all sites. . Modest increase in observation/measure- ment over alternative 3.	. Costs 55% more. . Decreasing inspect utility.
5	. Over 600% more onsite time for all sites. . Same direct observa- tion/measurement as alternative 3.	. Costs 90% more. . Decreasing inspect utility.

Alternative 2 is slightly less costly (7%) than alternative 3 but yields only 60% as many onsite hours. In addition, it applies these extra hours to a sampling of sites based on location rather than performance. While total hours of presence are increased by alternative 2, the frequency of presence is increased only at the clustered sites. Thus, benefits are not realized at the majority of sites.

While alternative 5 yields the greatest increase in onsite time, it is about twice as costly as the current program. Furthermore, the utility of the additional onsite time is significantly diminished.

The most difficult choice is between alternatives 3 and 4. The basic judgment involves the value of doubling onsite time versus the cost of 263 additional people. The additional expense would be warranted if the time could be used productively (i.e., could increase confidence and could be a meaningful job for a highly qualified inspector). Since alternative 3 provides more than twice the onsite time spent in the current program, and since the full time inspector in alternative 3 can cover all key events, it is unlikely that much more confidence could be gained by redoubling the onsite time. Furthermore, it would be difficult to provide a challenging job for the inspectors because there is a limited amount of significant activity during non-prime shifts. For these reasons, alternative 3 is preferred.

The current inspection program can be improved by increasing onsite presence and by increasing capabilities to perform independent verification. A full time onsite inspection program provides these improvements and will encourage better licensee performance. This program will not change in any way the relationships and responsibilities of the licensing offices (NRR and NMSS) and IE for the safety of licensed facilities. The program is feasible and can be implemented with a reasonable increase in IE manpower.

Other Comments: Implementation of this program will require prompt action on a number of key issues. An implementation task leader has been appointed and given the authority and responsibility for promptly preparing an implementation plan. Intensive task planning is underway involving both Headquarters and Regional IE personnel as well as other NRC offices such as ELD, ADM, and OIA. Small teams will establish the work plan and schedule and complete the tasks.

The recommended inspection program has four important characteristics: (1) inspectors located full time onsite with periodic support by region-based technical specialists; (2) special inspection teams directed by IE Headquarters and embodying intensive examination of licensee performance in specialized areas; (3) a substantial increase in the amount of direct observation and measurement by IE inspectors; and (4) the work area inspections by the onsite inspector, the regional inspections and the special team inspections will be largely unannounced.

The needed increase in FY 78 IE staffing over the current budget submission will be 125 persons. The budget increase will be six million dollars. This program will also have an impact on other NRC office staffing and budgets. For example, NRR believes that it will need an increase in staffing equal to at least 10% of IE staffing increase to implement its increased safety activities resulting from the program. The impact will be addressed as part of the budget process.

IE recognizes that this program presents implementation challenges. However, we firmly believe that with proper planning and strong management those challenges can be met and successful implementation can be achieved.

Recommendation: Approve implementation of a full time onsite inspection program.

Coordination: The Offices of Nuclear Reactor Regulation, Standards Development, Executive Legal Director, Administration and Controller concur with this paper. The Offices of Nuclear Material Safety and Safeguards and State Programs have reviewed the paper for information.

Sunshine Act: This paper is recommended for discussion at an open session. OGC and OPE concur.

Anticipated Scheduling: Week of May 30.

Ernst Volgenau
Director
Office of Inspection and Enforcement

Enclosure:
Study Report - NRC Inspection Alternatives

NOTE: Commissioners' comments or consent should be provided directly to the Office of the Secretary by cob Monday, May 16, 1

Commission staff office comments, if any , should be submitted to the Commissioners NLT May 11, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

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STUDY REPORT

NRC INSPECTION ALTERNATIVES

Office of Inspection and Enforcement

U.S. Nuclear Regulatory Commission

April 1977

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SECTION I

INTRODUCTION

In June 1974, the Office of Inspection and Enforcement (IE) initiated a Trial Program to evaluate the concept of assigning inspectors to locations near nuclear power reactors. This two year program involved the assignment of two NRC inspectors to locations from which they were able to inspect a total of four reactor sites. The evaluation of this Trial Program concluded that the concept of resident inspectors is viable because it can provide a number of significant benefits, principally involving the efficient and effective use of an inspector's time.

IE's efforts in pursuing various resident inspection concepts are consistent with the stated interests of the new Administration in improving federal oversight of the nuclear industry. This paper describes and evaluates four alternative resident inspection concepts vis-a-vis the current program, identifies the concept of full-time onsite inspectors as a preferred alternative, and describes the tasks necessary to implement this preferred alternative .

Background

The basis for licensing and regulating nuclear facilities is found in the Atomic Energy Act of 1954, as amended, which established private ownership and government licensing of nuclear facilities. The Act also prescribed that such facilities are subject to Atomic Energy Commission (AEC) requirements to protect the public health and safety. This regulatory authority of the AEC was transferred to the Nuclear Regulatory Commission (NRC) by the Energy Reorganization Act of 1974.

The primary safety consideration in the operation of any nuclear facility is the control and containment of radioactive material under both normal and accident conditions. Since the potential consequences of significant exposure to radiation are large, its risks must be kept as small as possible. A number of controls are established for this purpose.

The industry and the NRC have complementary roles in providing these controls and in ensuring that they are maintained. The NRC establishes rules, regulations, standards and guides for the construction and operation of nuclear facilities. The licensee has the direct responsibility to design, construct, test and operate a facility in a safe manner. The NRC, through its licensing and inspection programs, provides reasonable assurance that the licensee is fulfilling this responsibility and that the health and safety of the public are protected.

NRC Safety Assurance Program

An adequate level of nuclear reactor safety is achieved and maintained because plants are properly designed, constructed, operated and maintained using applicable standards and quality assurance practices. The NRC standards, licensing and inspection programs assure that these important elements of safety are appropriately addressed over the lifetime of a reactor. These NRC activities integrate meaningful requirements, thorough safety review by both the licensee and the agency and continuing periodic inspection by both groups. In safety reviews, NRC emphasizes the licensee's system design for fabrication, construction and quality assurance. In inspection, NRC emphasizes licensee management control of these activities.

The underlying philosophy of the design of facilities and the NRC safety review is defense-in-depth, or multiple levels of defense against accidents. Defense-in-depth provides three primary levels of protection. First, the plant is designed to prevent accidents through intrinsic design features, quality components and construction, and redundant systems and controls. Systems essential to safe control are designed to automatically revert to a safe state during adverse conditions. The second level consists of safety systems that protect operators and the public by preventing incidents or minimizing damage should those incidents occur. The third level of safety consists of additional safety systems to accommodate severe hypothetical accidents that involve independent failures of the redundant protective systems at the same time as the accident they are designed to control. In summary, nuclear facilities are protected by exacting standards of design and construction, independent safety systems and redundant safety systems to provide protection in the unlikely event of multiple failures. Additional protection is provided by highly trained reactor operators.

The NRC Inspection Program

Inspections during the licensing process are part of NRC's acceptance of applications and the issuance of construction permits and operating licenses. Inspections continue thereafter throughout the operating life of a nuclear facility.

Prior to construction, the inspection program concentrates on the applicant's establishment and implementation of a quality assurance program. Quality assurance comprises all the systematic activities

that are necessary to provide adequate confidence that a key structure, system or component will perform satisfactorily in service. Inspections cover quality assurance activities related to design, procurement and the plans for fabrication and construction. An acceptable inspection finding is a prerequisite for NRC's docketing of an application for review and subsequently, for issuing a construction permit.

During construction, a sampling of licensee activities is inspected to make sure that the requirements of the construction permit are followed and that the plant is built according to design and applicable codes and standards. Construction inspections look for sound management, qualified personnel, quality material, conformance to approved design and for a well formulated and satisfactorily implemented quality assurance program, since these factors are most important to the successful construction of a nuclear plant. The licensee's implementation of these factors is assessed by examination, on a spot check basis, of construction activities.

As construction nears completion, preoperational testing to demonstrate the operational readiness of the plant and its staff begins. Inspections during this phase determine whether the licensee has developed adequate test plans, assure that tests are consistent with NRC requirements and determine that the plant and its staff are prepared for safe operation. Inspections during the preoperational phase involve (1) reviewing overall test management procedures; (2) examining selected test procedures for technical adequacy; and (3) witnessing and review of selected tests to determine their outcomes and the consistency of planned and actual tests. In addition, inspections review the qualifications of operating personnel and assure that operating procedures and quality assurance plans are developed.

About six months before NRC's operating license is issued a startup phase begins in preparation for fuel loading and power ascension. Following the issuance of an operating license, fuel is loaded into the reactor and the actual startup test program begins. As in preoperational testing, NRC inspection emphasis is placed on test management procedures and results. The licensee's startup test management system is examined, test procedures are analyzed, tests are witnessed and licensee evaluations of test results are reviewed.

When startup testing is completed satisfactorily, routine operations begin. Thereafter, NRC continues its inspection program throughout the operating life of the plant to verify that the licensee's control systems assure the safe operation of the plant in compliance with NRC requirements. Specific elements of the operating reactor inspection program are:

Reviews of the basic systems and procedures the licensee follows to be certain they conform with requirements, are technically sound and are implemented properly.

Analysis of records of licensee operation and interviews of personnel to confirm that actions called for by the prescribed systems and procedures are routinely followed.

Periodic verification of licensee and system performance by means of independent NRC observations, tests or measurements.

Additional inspection activities are also conducted. Each year inspectors examine licensee Review and Audit Committee actions and changes to the quality assurance program and the operating staff. They also examine Licensee Event Reports; facility operating procedures; training program details; refueling activities; spent fuel shipments; and functional testing, calibration and maintenance activities. In addition to these defined inspection activities, approximately 20% of an inspector's on-site time is scheduled for conducting unprogrammed direct observations of the plant or examining specific areas of interest or concern. NRC inspectors also conduct detailed inspections and investigations in specific areas as a result of apparent plant weaknesses, events or allegations.

In summary, the NRC inspection program is designed to provide reasonable assurance that public health and safety are protected by monitoring licensee activities throughout a nuclear facility's lifetime. To do this, the inspection program verifies that the licensee's control programs are implemented; that plants are constructed properly; that required tests are conducted and results are acceptable before routine operations begin; and that the plant is operated safely.

Improving the Current Program

The current inspection program has evolved over the past twenty years as the nuclear industry, safety technology and the safety awareness of the public have grown. The inspection program reflects the belief that safety cannot be inspected into a plant. Rather, safety is the result of conservative design, quality components, proper construction and testing, qualified people and sound management applied at each phase. The proper role for inspection is to assure that these elements are maintained.

In keeping with this philosophy, the NRC inspection program concentrates on licensee control activities. In emphasizes control by licensee management through quality assurance programs and systems, rather than NRC

acceptance of components and hardware systems. If licensee activities are properly controlled and conducted, then the resulting systems should function so that the safety afforded by the defense-in-depth design of the facility will be realized. This philosophy is at least partially responsible for the excellent safety record of the nuclear industry.

The current program normally is conducted by inspectors or teams of inspectors operating from five Regional Offices, performing periodic inspections at licensee sites. About 25% of an inspector's time is spent onsite inspecting licensee activities while most of the balance is spent in the regional offices preparing for inspections, evaluating inspection findings, and documenting inspections performed. Since on-site time is limited, there is limited opportunity for direct observation of licensee activities, and the current program must place considerable confidence on the accuracy and completeness of licensee statements and documents that attest to those licensee actions performed without NRC direct observation. Because of the reliance placed on these licensee statements and documents, it would be prudent to increase confidence in their accuracy and completeness. By expanding verification of licensee actions, NRC would have more confidence in licensee records and could more readily assess the safety of licensee activities.

This post-performance audit would consist of the NRC or its contractors verifying the accuracy and completeness of the licensee records through an independent program of direct measurement. In addition to this post-performance verification, more direct observation of activities underway at licensee sites should increase NRC confidence that the licensee control systems produce proper actions.

In addition to providing an independent assessment of licensee performance, the inspection program today is thought to provide a positive incentive for proper licensee performance. This incentive is apparently based upon inspector presence onsite and licensee uncertainty as to what is to be inspected. The Trial Program evaluation concluded that licensees place greater emphasis on regulatory requirements as association between NRC inspectors and plant staff is increased. More inspector presence on-site should therefore encourage improved licensee understanding and awareness of regulatory requirements.

Increasing the time an inspector spends onsite provides more opportunity for directly observing licensee activities and assessing the overall safety condition of the plant. Because of the improved familiarity with a specific plant that would result from more onsite time, an inspector, in addition to detecting instances of noncompliance with regulations, would be better able to assist in identifying potential problem areas before they developed into safety hazards. Therefore, increasing onsite time would result in a higher level of confidence that licensed activities are conducted safely.

The existing NRC inspection program provides an adequate technical basis upon which to assure the safety of licensee operations. The improvements identified above would strengthen this technical basis and, at the same time, add an important benefit by increasing the public perception of the adequacy of the NRC inspection program. Regardless of its technical basis, an inspection program that fails to convince the public of its adequacy will continually be the subject of controversy and suspicion.

Criticisms of the existing inspection program follow three consistent themes: (1) there are too few NRC inspections; (2) inspectors spend too little time actually at the plant; and (3) even when onsite, inspectors spend too much time reviewing paperwork as opposed to observing actual work or observing and conducting tests and measurements. A decided move by NRC into more direct verification/measurements and refining the program to provide more onsite time enhances the base for NRC technical judgments and, at the same time, effectively responds to those criticisms.

These changes are expected to:

Increase NRC knowledge of the conditions at a licensed facility and provide a better technical base for regulatory action.

Lessen the program's reliance on the accuracy and completeness of licensee records by improving the inspector's ability to independently verify licensee performance.

Provide additional assurance that licensee management control systems are effective and that licensee performance is acceptable.

Improve the NRC posture relative to incident response.

As an additional benefit, the Trial Program suggests that these changes should also improve the credibility of the program in the licensee's eyes.

The refinements introduced above form the basis for three goals that the NRC inspection program should satisfy:

> Establish greater NRC presence onsite at licensee facilities.
>
> Increase the direct observation of key licensee activities by NRC inspectors.
>
> Enhance the confidence in licensee records by increasing NRC direct verification/measurement activity.

The sections that follow identify and evaluate four alternatives that the Office of Inspection and Enforcement could pursue to achieve these goals.

Each of these alternatives preserves the underlying philosophy of NRC regulation and inspection. The licensee would continue to be directly responsible for designing, constructing, testing, and operating the facility in a safe manner. NRC inspectors, whether stationed onsite or in Regional Offices, would remain independent of the licensee's control systems while assuring that the licensee was providing adequate protection. Finally, each of the alternatives maintains the present scope of responsibilities of the Office of Inspection and Enforcement involving the evaluation of licensee performance with respect to safety and safeguards matters.

SECTION II

DESCRIPTION OF INSPECTION ALTERNATIVES

Alternatives

Five alternatives are described that permit varying degrees of inspector presence, direct observation of licensee activities and the use of independent measurements. The Current Program, relying upon regional inspectors, is alternative 1 and is used as a baseline against which the other alternatives are compared. The Site Vicinity concept, alternative 2, involves placing some inspectors in the vicinity of clusters of reactor sites and supplementing their inspection effort with special performance appraisal and direct verification/measurement teams. Alternative 3, Full Time Onsite, calls for an NRC inspector at every reactor site to provide daily inspection coverage. Alternatives 4, Continuous Onsite, and 5, Continuous in Control Room, provide extended inspection coverage and require an NRC inspector to be continuously present at the site or in the control room of each reactor with an operating license. Each of the alternatives that places an inspector onsite would also involve in-depth performance appraisal and direct verification/measurement inspections conducted by a skilled and diverse group of NRC inspectors.

Components of the Alternatives

There are four basic components that comprise the inspection alternatives identified above. To avoid duplication, the components are identified and discussed at a conceptual level before they are combined to form inspection alternatives. The inspection components are:

Regional inspections involving NRC inspectors, either project or technical support, operating out of Regional Offices (as in the present program).

Resident inspections conducted by inspectors stationed at (or in the vicinity of) licensed facilities.

Direct verification/measurement inspections conducted by NRC inspectors and possibly contractor personnel to observe work in progress or independently test licensee activities.

Performance appraisal inspections conducted by a select group of skilled and diverse NRC inspectors to provide a short period of concentrated inspection of any or all aspects of a licensee's operation.

Using the regional inspection approach, NRC inspectors are loca[illegible] in Regional Offices and periodically travel to licensed facilities to make inspections. In the present program, an inspector spends about [illegible] percent of total available time onsite at licensee facilities, and each operating reactor licensee typically receives about two inspections of two to three days duration each month, either by a single inspector or by a team composed of several inspectors.

Regional inspectors are of two main types, project and technical support. Project inspectors are usually generalists with technical knowledge in the broad spectrum of activities conducted by the licensee. They are responsible for conducting inspections in certain areas and for monitoring the overall inspection status of a site, coordinating the total ongoing inspection effort at the site, assuring all necessary inspection requirements are fulfilled and following up on all outstanding items and enforcement actions. Project inspectors normally serve as the point of contact between the licensee and the regional inspection organization. Technical support inspectors are specialists that possess a high degree of expertise in one or more engineering or scientific disciplines related to licensee activities. Technical support inspectors provide coverage of specific technical areas and support the inspection effort of the project inspectors.

Under the current regional inspection program, inspectors examine technical procedures, management controls and licensee records and observe licensee activities. Approximately 20-30% of onsite time is spent in direct observation and independent measurement.

Using the resident inspection concept, some inspectors would be located either at or in the vicinity of licensed facilities. Project inspectors would be best suited for resident inspector duty, because the situations encountered at the site may cover a spectrum of activities. Technical support inspections appear more suited to regional rather than resident inspectors because the expertise of the technical specialist is more narrow than the project inspector and can be used more effectively and efficiently when applied to a number of different locations. There are several possible variations of this approach. If located near "clusters" of reactors, one site vicinity inspector might be able to provide inspection coverage to all the clustered facilities by spending a percentage of his time at each. Assigning one onsite inspector to each facility would permit the inspector to concentrate efforts even further. Continuous onsite coverage for a particular facility could be achieved by assigning a number of inspectors to each site. For all alternatives using resident project inspectors, technical support is still provided by inspectors from the Regional Offices.

The concept of resident inspections was evaluated in the Trial Resident Inspection Program. The Trial Program concluded that the concept was a viable inspection method and contributed to the effectiveness and efficiency of inspectors. In addition to the benefit of increasing licensee awareness of regulatory requirements cited in Section I, a resident inspector was shown to enhance NRC awareness of facility status. Licensee acceptance of the NRC inspector was improved which resulted in easier access to facility records and increased independence of inspection effort. Because of the results of the Trial Program, the resident concept is used as part of each alternative to the current program considered.

One of the prime functions of an onsite inspector would be to extend NRC onsite examination of the implementation of the quality assurance program through increased direct observation of the work and testing procedures. The onsite inspectors would determine that licensee work and maintenance procedures were adequate and, by observation, verify that these activities were conducted properly and at the required frequency. In addition, inspectors would examine events to determine the adequacy of licensee actions and reports. Their proximity to and familiarity with a specific site would allow immediate onsite inspector response to significant events. Although onsite inspectors could not possess all the specific expertise and skill of the regional technical support groups, they would be capable of recognizing actual and potential safety problems and, if necessary, could then refer these items to the technical support inspectors for resolution.

Independent Verification has two forms - direct observation of work and confirmatory measurements. Both types of independent verification are intended to provide credible assurance that the licensee has conducted various types of work properly. Direct observation involves witnessing licensee activities in progress. This "over the shoulder" observation can be done by both project and technical support inspectors. While the opportunities for direct observation are probably greater for resident inspectors, it is common practice for regional inspectors to observe particularly significant work in progress as part of the current inspection program. The number and types of these observations should be based upon a determination of the most safety-significant licensee work units, the degree to which this work can be meaningfully observed and the degree of confidence desired.

Confirmatory measurements differ from direct observation in that they are "hands on" (as opposed to "over the shoulder") inspections. These types of inspections involve technical verification that the licensee has done certain work properly. Through confirmatory measurement inspections, those licensee activities that are not subjected to direct observation by the resident inspector or specialists still are subject to direct verification by the NRC but on a post-performance basis. This inspection technique can increase the NRC's confidence in the technical performance of the licensee and in the accuracy and completeness of licensee documentation. While some measures may be appropriate for an onsite inspection, it may not be an efficient allocation of resources to duplicate at each site the confirmatory measurement capability that involves specific technical talents and equipment. Therefore, NRC inspectors supplemented by contractor technical support would be used as specialists to perform these technical measurements and tests. As in the case of direct observation, the number and type of confirmatory measurement inspections would be based upon the degree to which safety-significant plant parameters should and can be verified by test or measurement and the desired degree of confidence.

Performance appraisal inspections are thorough critical reviews of licensee facilities by a select group of experienced NRC inspectors. While the current inspection program appraises the performance of licensees, intensive performance appraisal inspections are not conducted as a part of it. These appraisals would provide an additional layer of inspection in assuring the safe operation of licensed facilities. Inspectors would be chosen for their expertise and experience. The specific disciplines needed on a particular team would be based on the type of facility inspected, the type of problems experienced at that facility in the past and other factors.

Performance appraisal inspections would be aimed primarily at the licensee's total control of plant activities. Therefore, the orientation of these inspections would be toward corporate and offsite management control as demonstrated by onsite licensee performance. The onsite inspections would involve detailed examination of selected areas of the licensee's activities supplemented by a reliance on the direct verification/measurement performed by the regional or resident and the technical support inspectors. The performance appraisal inspections would verify that the licensee control systems assure adequate performance in safety-related matters.

The teams conducting the performance appraisal inspections would examine essentially the same areas of different licensee's activities without regard to regional boundaries. This would bring a national perspective to inspection and allow the NRC to obtain a more objective view of licensee performance and of the effectiveness of the total regulatory program. In addition to appraising the licensees' activities, the results of performance appraisal inspections should indicate the effectiveness of the routine inspection program and provide insight into the performance of the onsite inspectors.

The frequency of performance appraisal inspections might average one per year per site, with more frequent inspection devoted to licensees with known or suspected problem areas. A desirable output of these appraisal inspections would be acknowledgment of those areas in which the licensee was doing a particularly good job.

The timing of these inspections would be based on factors such as: (1) the time since the last appraisal inspection; (2) licensee performance; (3) requests by Regional Offices; and (4) other events warranting examination. Teams would establish specific objectives and schedules for each inspection and focus on major safety-significant areas. The teams would prepare inspection reports with findings that would be turned over to the Regional Office for followup or for enforcement. These inspections would not replace reactive inspections that the Regions would perform to respond to incidents or allegations.

Inspection Alternatives

The basic components can be combined into inspection program alternatives that increase inspector presence and strengthen the program's independent verification capability. Using the current inspection program as a baseline, this section briefly describes four additional alternatives that represent progressively increased effort. Evaluations of the baseline current program and the four other alternatives are presented in Section III.

Alternative 1: Current Program. The current inspection program relies on regionally-based project and technical support inspectors. Inspectors periodically travel to licensed facilities and each facility typically receives about two inspections per month of two to three days duration by a single inspector or a team of several inspectors.

Alternative 1 is used as the baseline for evaluation. The program described in Section I would grow in succeeding years to accommodate additional facilities and workload but the technical program and inspection approach would remain substantially unchanged.

Alternative 2: Site Vicinity Inspections. This option involves locating inspectors near clusters of reactor sites. The recent Trial Program to evaluate this concept concluded that the concept is preferred over regional inspectors for a cluster of three or more operating reactors within a radius of about 25 miles. The Trial Program evaluation also indicated that the site-vicinity concept appears appropriate for construction sites as well as operating reactors. In alternative 2, a site vicinity inspector is assumed to perform that part of the routine inspection program normally performed by project inspectors based in a Regional Office. Depending on the number of reactors and number of sites in the cluster and an individual's technical qualifications, some technical support inspection requirements could also be covered by the site vicinity inspector. In addition, the site vicinity inspector would spend considerable time onsite observing and evaluating licensee activities. Based upon projections of the number of reactor sites in various phases and locations, it is estimated that site vicinity inspectors could be placed at 11 clusters involving 21 sites in FY 81. The site vicinity inspections would be supplemented by performance appraisal inspections and regional technical support inspections each with increased direct verification/measurement capability.

Alternative 3: Full Time Onsite Inspections. The third option to accomplish the goals set forth in Section I is to locate at least one NRC inspector at each power reactor site. For a fully implemented program, one inspector would be assigned for each reactor phase (construction, preoperational testing, startup or operations) represented at a site. If there were more than two reactors in any one of the phases, additional inspectors would be required so that no inspector would cover more than two reactors. The onsite inspector would perform the project portion of the routine inspection program and some of the technical support portion. The remaining technical support would be provided by the Regions. In addition to conducting the defined inspection program, the onsite inspector would perform independent inspection, additional direct observation and other evaluation of licensee activities.

The onsite inspector would maintain an office at the reactor site and would perform the duties described previously. Work area inspections would be unannounced to the licensees and would be performed during non-prime as well as prime shifts.

Performance appraisal and confirmatory measurement inspections would also be included in alternative 3.

Alternative 4: Continous Onsite Inspectors (24 hours per day). A fourth option to accomplish the Section I goals is to locate a sufficient number of inspectors at each site with a reactor in startup or operation to provide continuous coverage of these facilities. For reactors in construction and pre-operational testing, NRC would continue to provide the full time onsite coverage described for alternative 3. Alternative 4 is similar to alternative 3 in all respects, except it requires a greater level of effort due to the continuous coverage in startup and operation. Performance appraisal and confirmatory measurement inspection would be included in this alternative.

Alternative 5: Continuous Control Room Inspectors (24 hours per day). The final alternative involves placing a number of NRC inspectors in each power reactor control room to provide full-time coverage. Inspectors monitoring control room activities on a full-time basis would be dedicated to that task and would not perform the routine inspection program or the other duties of regional or resident inspectors. Because of the importance of the other onsite operations such as work and maintenance activities and the testing and startup programs, the continuous control room inspector must be supplemented by an inspection program that examines the other facets of a licensee's operation. The Regional and site vicinity inspection concepts are inconsistent with placing an NRC inspector continuously in a control room. If an NRC inspector is to observe control room operations to the degree a monitor would, then, at a minimum, an experienced generalist should probe other aspects of licensee operations to the same depth. Alternative 4 is consistent with the control room concept but would duplicate much of the control room effort. Therefore, the control room monitor was added to the Full Time Onsite alternative to maintain consistency and avoid duplication of work. Alternative 5 is identical to alternative 3 with the addition of control room inspectors.

SECTION III

EVALUATION OF INSPECTION ALTERNATIVES

Introduction

The criteria that constitute the basis for evaluating inspection alternatives involve both qualitative and quantitative considerations. This section defines these criteria and examines the benefits of each alternative as well as the costs. To provide a consistent basis for evaluation, each alternative is assumed to be implemented and operating in a steady state condition by the end of FY 81.

Evaluation Criteria

The Office of Inspection and Enforcement interacts with other functional elements of NRC and with licensees to insure safe licensee operations. During the licensing process, NRC verifies that licensees are competent to comply with regulatory requirements. Subsequent IE inspections determine whether they are actually complying with these requirements. If instances of noncompliance are found, IE undertakes the measures necessary to insure that licensees take corrective action. Furthermore, IE identifies potentially unsafe conditions in nuclear facilities that indicate inadequate regulatory requirements, and provides feedback to licensees and appropriate NRC offices when these situations are found.

The ability of IE to detect noncompliance and unsafe conditions depends upon the type of inspection program and how it is used. Therefore, inspection approaches and alternatives should be judged, at least in part, on how they satisfy the following criteria associated with program performance:

Competency. Inspectors should be thoroughly familiar with the the regulatory program, technically proficient and well acquainted with the facility.

Utility. The inspection program should maximize the inspector's capability and opportunity to observe those licensee activities that are meaningful to safety.

Flexibility. The program should provide the opportunity for inspectors to pursue noncompliance and safety matters to a satisfactory resolution.

Objectivity. The program should provide for the evaluation of licensee activities without significant influence from interpersonal relations. Correction of safety-related problems must be achieved without the involvement of inspectors in licensees' internal control systems.

Motivation of Licensees. The program should reinforce continuing licensee awareness of and attention to responsibilities to protect the public. In this regard, the program should provide licensees with encouragement to improve and should minimize disruptions of licensee activities.

These qualitative criteria pertain to the ability of the inspection program to detect and achieve correction of instances of noncompliance and respond to other areas of concern. However, the viability of the inspection alternatives also depends upon quantitative factors describing program benefits and costs. These factors are:

Manpower Requirements. Number and type of people required.

Dollar Costs. Manpower and other program costs expressed in dollar amounts.

Program Effectiveness and Efficiency. Measures expressed in terms of inspector onsite time. While inspector onsite time is not a direct measure of effectiveness or efficiency, it can be used as an indicator since the Trial Resident Inspection Program concluded that increased onsite presence:

Improves inspector effectiveness through increased direct observation of facility operations.

Enhances NRC awareness of facility status.

Enhances inspector acceptance by the licensee resulting in easier access to facility records and increased independence of inspection effort.

Reduces licensee efforts required to support the inspection program.

Enhances licensee management attention to NRC requirements.

Qualitative Evaluation

This portion of the evaluation considers each of the inspection alternatives in light of the five qualitative criteria: competency, utility, flexibility, objectivity, and motivation of licensees.

Alternative 1: Current Program

Competency. Inspectors are highly qualified and competent and have excellent knowledge of a number of relevant technical disciplines as well as the various facilities they inspect. Formal training opportunities are ample and readily accessible and the Regional environment permits extensive interaction with peers. Since inspectors are assigned to more than one plant, they may not be totally familiar with the details of each plant. Their knowledge of plant status depends on visit schedules and telephone contacts with licensees.

Utility. Because of travel requirements and other practical constraints, a regional inspector is able to spend about 25 percent of total available time onsite. Further increases in onsite time would routinely require inspectors to travel one week out of every two. The opportunities for evaluating all aspects of plant activity are limited by the amount of onsite time available.

Flexibility. The present program of regional inspections encourages inspectors to pursue compliance and safety-related matters to resolution. As a practical matter, however, the onsite time available limits the inspector's opportunity to obtain resolution of individual problems and allows less than 10% of the onsite time in independent inspection effort to pursue matters of technical interest outside the pre-planned program.

Objectivity. The opportunity for loss of objectivity by regional inspection is small.

Motivation of Licensees. As shown by the Trial Resident Inspection Program, licensees awareness of regulatory requirements can be increased through more frequent interaction with NRC inspectors. The current program does not provide much opportunity for such interaction.

Alternative 2: Site Vicinity

Competency. Inspectors would become more familiar with the facilities for which they are responsible because they would typically spend part of nearly every day onsite. However, dispersing inspectors into a large number of small groups would preclude day-to-day interaction with other inspectors and supervisors that contributes both to professional growth and current knowledge of regulatory requirements.

Utility. The site vicinity approach would permit inspectors to spend a greater amount of time onsite than the regional inspection approach and would allow better knowledge of site activities. Moreover, inspection effort could be better scheduled to coincide with significant site activity.

Flexibility. The ability of the site vicinity inspectors to pursue matters of safety concern would be enchanced because of the increased onsite time, familiarity with the facility and the opportunity for non-prime work hours inspections.

Objectivity. The site vicinity inspectors would not maintain an onsite office and would spend only a portion of time at the site. However, as the only NRC employee in the vicinity, day-to-day technical and professional interactions could be limited to those with licensee employees. While the potential for loss of objectivity would be greater than that of the regional inspector, the Trial Program inspectors suffered no detectable loss of objectivity.

Motivation of Licensees. Licensee attentiveness to regulatory requirements should be enhanced at those facilities where site vicinity inspectors are assigned. However, a major drawback of this approach is that inspectors would be assigned to a limited number of sites that would be chosen on the basis of geographical, rather than performance, considerations. Hence, the positive benefit of this motivation would be realized only at those sites located in clusters.

Alternative 3: Full Time Onsite

Competency. Using this approach, inspectors would develop considerable familiarity with the licensee facility since each inspector's responsibility would be limited to a single site. Without periodic reassignment of inspectors, however,

an inspector might not gain the breadth of ex[illegible]ence that comes from exposure to a number of different [illegible]lities. Furthermore, providing formal training to ons[illegible] inspectors would pose practical logistics problems. Ons[illegible] inspectors would also lose the daily professional intera[illegible]on with NRC peers available to regional inspectors.

Utility. Inspectors would be able to conduct [illegible]pections at various times during the daily work cycle, in[illegible]ding both prime and non-prime shift operations. Inspect[illegible] presence onsite would be significantly increased and c[illegible] be selectively applied to emphasize safety-relate[illegible] licensee activities. Inspection activities would be e[illegible]tially unannounced.

Flexibility. The increased time onsite would [illegible]vide the inspector ample opportunity to detect and ver[illegible] correction of matters of safety concern.

Objectivity. Because of the daily working re[illegible]onship between inspector and licensee, this approac[illegible]ers greater risk of loss of inspector objectivity than tr[illegible]e vicinity approach. A closely related problem is the p[illegible]tial for inspector involvement in the licensee's inte[illegible]decision-making processes. As in the site vicinity a[illegible]ative, the inspector might find professional and social [illegible]s only among the licensee employees.

Motivation of Licensees. This alternative wo[illegible]provide increased inspector presence onsite and shou[illegible]ve a positive influence on motivation. The activi[illegible] available for inspection should be sufficient to make f[illegible]nd meaningful use of the inspector's time.

Alternative 4: Continuous Onsite

Competency. Alternative 4 provides inspector[illegible]und the clock at operating reactor sites. These inspec[illegible]s would become familiar with a specific facility, but w[illegible]d suffer the same professional disadvantages identifie[illegible] alternative 3, with the exception that they could in[illegible]t daily with a small group of NRC peers.

The number of inspectors needed to provide continuous coverage of all reactor sites would require a substantial increase in the size of the inspection force. The ability of NRC to expand the inspector force to this extent, while maintaining high standards of quality is questionable. Also, retaining high caliber inspectors would be difficult, since many of them would be assigned relatively unchallenging duties during the non-prime shifts.

Utility. The NRC inspection program emphasizes control by licensee management through quality assurance programs and systems. While placing inspectors continuously onsite would theoretically maximize the opportunity to detect noncompliance, it would not provide appreciably more perspective to the licensee activities than alternative 3, because there is not sufficient licensee activity to fully utilize inspectors on a three shift basis.

Flexibility. Continuous inspector presence would provide greater opportunity for prompt attention to matters of technical interest.

Objectivity. The possibility of loss of objectivity is less when a number of inspectors rather than an individual is stationed onsite because the group would provide professional interaction and dissuade overfamiliarity with the licensee.

Motivation of Licensees. Licensee awareness of and attention to regulatory requirements should be enhanced.

Alternative 5: Continuous in Control Room

Competency. The qualifications of control room inspectors are necessarily different from those of current NRC inspectors. While control room inspectors would need knowledge of NRC rules and regulations, they would also require training and experience equivalent to that of Senior Reactor Operators to meaningfully monitor control room activites.

Since control room inspectors would serve a monitoring function and rarely exercise their full professional capabilities, it would be difficult to maintain technical

proficiency during the onsite tenure despite supplemental training. In addition, retaining qualified control room inspectors could prove difficult because of the nature of the job.

Utility. Only in the event that the licensed operator did not perform in a manner to assure the safe functioning of the plant would the control room inspector be called upon to act. These instances occur infrequently. Moreover, increased inspector resources could be used more effectively if applied across the total plant rather than concentrated in control room operations.

Flexibility. It is not likely that these inspectors would contribute significantly to IE's ability to detect and achieve correction of noncompliance or unsafe conditions because their activities are limited to one facet of licensee operations.

Objectivity. Because of the close and constant working relationship between control room inspectors and licensed reactor operators, the possibility exists that interpersonal relations would enter into the inspector's evaluation of the safety of control room activities. In situations where prompt and responsible actions on the part of the licensed operator are needed, the tendency may exist to consult with or defer to the NRC control room inspector those decisions that must be made by responsible licensee management.

Motivation of Licensees. The control room inspector would impact only control room personnel and could positively influence them to conform to requirements.

Quantitative Evaluation

To provide a consistent basis for evaluation, each alternative is projected to FY 81. Estimates of resource requirements (manpower and dollars) and onsite time are based on currently forecast FY 81 workload with each inspection alternative operating in steady state.

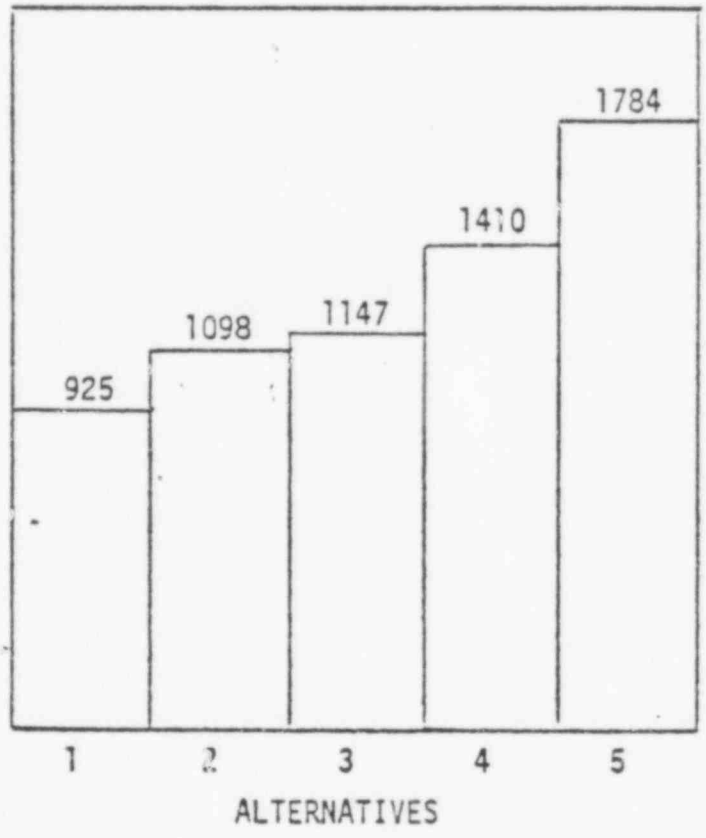
Manpower Requirements. Alternative 1, the current program, relies on regionally based inspectors to accomplish the entire inspection workload. Alternatives 2-5 require a mix of regional and onsite inspectors complemented by Special Inspection Teams. The manpower requirements describe the relative effort involved in accomplishing the alternative inspection programs and serve as a basis for comparison. Appendix A describes the manpower calculations. Table 1 summarizes these requirements. Reactor technical support inspectors include all I&E, IP, health physics, power reactor technical support and non-power reactor inspectors.

TABLE 1 IE MANPOWER FOR INSPECTION ALTERNATIVES FY 81

	1	2	3	4	5
REGION					
Reactor Tech Support	370	362	275	175	275
LCVIP	39	39	39	39	39
Fuel Cycle	63	63	63	63	63
Safeguards	90	90	90	62	90
Direction/Admin.	198	199	208	154	189
ONSITE					
Construction/PreOps	0	3	62	62	62
Operations/Startup	0	10	71	426	71
Control Room	0	0	0	0	540
Admin. Support	0	0	0	71	71
SPECIAL TEAMS					
Inspectors/Analysts	0	120	120	120	120
Direction/Admin.	0	37	37	37	37
HEADQUARTERS					
Direction/Admin.	165	175	182	201	227
TOTALS	925	1098	1147	1410	1784

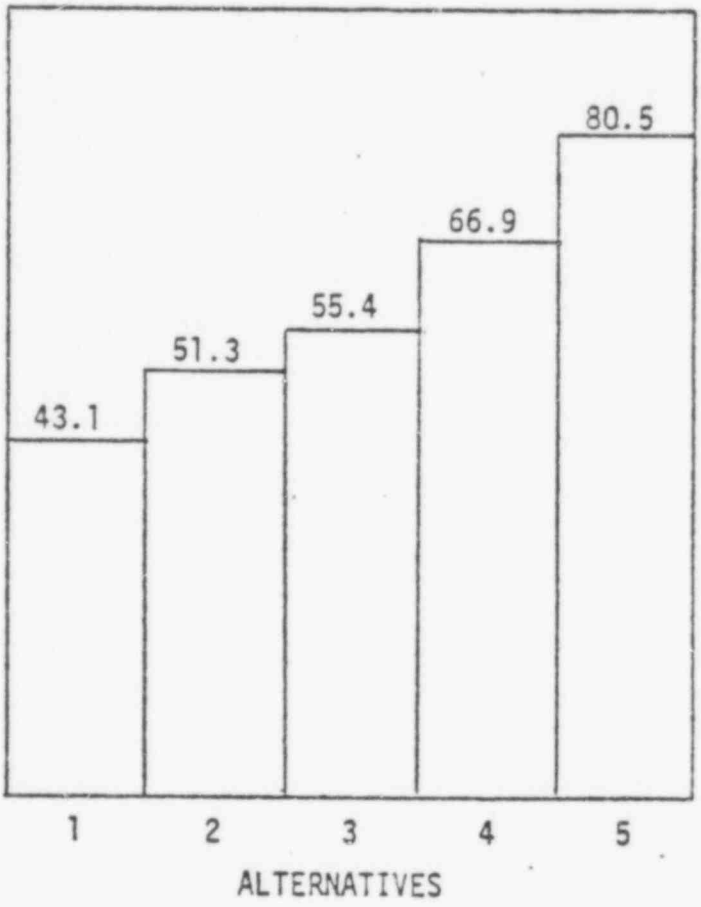
The total IE manpower required under each alternative in FY 81 is shown in Figure 1 below.

Figure 1 FY 81 Manpower



The estimated funding required to operate these alternatives in FY 81 is based on the IE Five Year Plan for Alternative 1 and computed additions to this amount for the other alternatives. Figure 2 shows the total FY 81 dollar requirements for each alternative.

Figure 2 FY 81 Dollars (Millions)



Onsite Presence

Each inspection alternative provides more presence onsite. The total hours are calculated in Appendix B and are summarized in Table 2.

TABLE 2 TOTAL ANNUAL ONSITE PRESENCE
(Thousands of Hours)

	1	2	3	4	5
	Current Program	Site Vicinity	Full Time Onsite	Continuous Onsite	Control Room
Region Inspectors	175.1	171.0	127.5	63.5	127.0
Site Vicinity or Onsite Inspectors	-	7.8	207.5	718.7	207.5
Special Teams	-	40.8	40.8	40.8	40.8
Control Room Inspectors	-	-	-	-	946.0
TOTALS	175.1	219.6	375.8	823.0	1321.2

Alternative 2 is only slightly less costly (7%) than alternative 3, but yields only 60% as many onsite hours. In addition, it applies these extra hours to a sampling of sites based on geographic not performance criteria. While hours of presence are increased by this alternative, the frequency of presence is increased only at the clustered sites.

Alternative 5 yields the greatest increase in onsite time, largely from control room inspections. However, it is about twice as costly as the current program. More importantly, alternative 5 does not appear desirable because of the questionable inspector utility and because of potential interference with licensee responsibilities.

The most difficult choice is between alternatives 3 and 4. The basic judgment involves the value of doubling onsite time versus the cost of 263 additional people. The additional expense would be warranted if the time could be used productively (i.e., could increase confidence and could be a meaningful job for a highly qualified inspector). Since alternative 3 already more than doubles the onsite time spent in the current program, and since the full-time inspector in alternative 3 can cover all key licensee activities, it is unlikely that much more confidence would be gained by doubling the onsite time. Furthermore, there is a limited amount of significant activity during non-prime shifts and it would be difficult to provide a challenging job for the inspectors. On balance, alternative 3 is preferred.

SECTION IV

CONCLUSIONS

While the current reactor inspection program has proved effective in determining that licensees have implemented systems to control construction, testing and operation, improvements could be made to this program that would provide a stronger basis for assuring that licensees are discharging their responsibility to provide adequate protection of the public health and safety. These improvements would allow more opportunity for directly verifying licensee actions and for confirming the accuracy and completeness of licensee work and documentation. In addition, increasing NRC inspector presence onsite would both heighten the licensee's awareness of NRC requirements and provide more occasion for assessing the effectiveness of licensee management controls and the safety of licensed operations.

While each of the alternatives to the existing program provides additional onsite time and enhances NRC's direct observation/measurement capability, the Full Time Onsite alternative is preferred. When fully implemented, this alternative will double the onsite time provided by the current program with a 39% increase in inspector manpower and a 30% increase in total program costs. The Full Time Onsite Inspection Program will place NRC inspectors in residence at nuclear sites under construction, in test and in operation. By the end of FY 1980, there will be at least one inspector on each site. By the end of the following year, additional inspectors will be stationed at sites with more than two reactors and at sites with reactors in more than one phase (construction, test or operation).

Inspectors will maintain separate, government-supplied office space and administrative support. The onsite inspectors will concentrate on directly observing key licensee activities. Work area inspections will be random and unannounced and may occur on non-prime as well as prime shifts. Inspectors based in Regional Offices will perform routine technical support inspections and will be available to the onsite inspector when specific technical assistance is required. In addition, special inspection teams will perform periodic, unannounced critical reviews of licensee facilities to assess the effectiveness of the routine inspection program and provide insight into the performance of onsite inspectors.

The Full Time Onsite alternative applies uniform inspection resources to all reactor licensees regardless of geographic location. Furthermore, the total inspection program provides a balanced perspective of licensee onsite activities; licensee management control systems as they

are demonstrated by onsite operations; and the results of licensee actions. This alternative recognizes the inter-related nature of licensee activities that impact on safety and affords each one an appropriate measure of inspection effort. The significantly increased direct observation that this program affords should yield increased information that can be fed back to the Office of Nuclear Reactor Regulation for evaluation and incorporation into the licensing process. It should be emphasized that this program will not change in any way the relationships and responsibilities of the licensing offices (NRR and NMSS) and IE for the safety of licensed facilities.

While there are many benefits associated with the Full Time Onsite alternative, IE recognizes that this alternative also risks compromise of inspector objectivity.

The inspection program will be structured to recognize that objectivity, particularly for resident inspectors, is difficult to maintain. The likelihood and consequences of loss of the resident inspector's objectivity will be compensated for in several ways:

By creating a job and career management program that is professionally and financially satisfying so that the motivation for loss of objectivity is reduced.

By selecting personnel of high caliber so that professional and social pressure will work to counter loss of objectivity.

By verifying the good character of inspector candidates through background investigations.

By assuring that standards of conduct are specifically stated and clearly understood by inspectors.

By providing inspectors clear guidance as to their duties and limits of their authority.

By close review of the work of inspectors, including onsite appraisals.

By complementing the efforts of resident inspectors with additional inspections by region-based inspectors and Special Inspection Teams under Headquarters control.

By routine transfer of resident inspectors on a periodic basis or early transfer if significant loss of objectivity is established.

The implementation of this program will also have an impact on the resource requirements of other NRC offices. While these impacts are not fully evaluated as part of this study, several offices have indicated that they anticipate additional workload under this program. The Office of Administration may require prompt augmentation to assist in recruiting and implementation. These additional requirements will be addressed as part of the implementation planning. Initial estimates by the Offices of Administration and the Executive Legal Director are that fewer than five people each will be required. The Office of Nuclear Reactor Regulation estimates that they will require one additional person for each ten additional inspectors to continue both formal and informal IE/NRR interaction. Other office requirements may be felt as soon as the increase in the IE workforce has occurred.

Planning for the new program must include provisions for re-examining its basic concept and effectiveness. While the details of this re-evaluation have not yet been defined, IE will develop a plan that identifies evaluation criteria and measures. An initial re-evaluation will be made within 18 months of program initiation.

Finally, while this study was directed to the reactor inspection program, there appear to be similar benefits that can be obtained at other major licensed facilities. IE will sponsor a follow-on study of other fuel cycle facilities to evaluate the application of resident inspection

SECTION V

IMPLEMENTATION

Introduction

In addition to a larger work force of the Office of Inspection and Enforcement, implementation of alternative 3 involves a number of other factors that will ultimately determine the success of the program. This section discusses the phased resource requirements necessary to achieve full implementation and identifies the planning tasks to be undertaken.

Resource Requirements - Phasing

The evaluation of the five inspection alternatives assumed steady state operation of the onsite inspection program by the end of FY 81. By the end of FY 80, at least one inspector will be assigned full-ti- to each site. To assure FY 81 implementation, recruitment and train- g must begin as soon as possible. Current estimates of the qualificat- ns required for onsite inspectors and the available market indicate that a new employee must spend at least two years in the IE organization before onsite assignment. Even then, not all will qualify but may spend additional time in a Regional Office to gain required experien-. The two years would be spent in formal training, performing regional inspections, and in OJT at a site. The requirement for this two year pipeline means that people recruited in FY 78 could not be placed onsite or relieve a significant percentage of experienced inspectors for onsite assignments until FY 80. Since onsite inspectors in FY 78 and FY 79 must be drawn from existing inspector manpower, not all sites can be manned immediately. However, several sites will be manned by the end of FY 77 and approximately 45 full time onsite inspectors will be in residence by the end of FY 79.

The manpower requirements to phase into full implementation by FY 81 are shown in Table 3. These requirements were derived based on the current forecast for licensing actions, a two-year pipeline for newly recruited personnel, voluntary moves of a limited number of current inspectors, an attrition rate of 5% for onsite inspectors and 15% for all others, gradual staffing of the special inspection teams and recruitment in FY 78 of the training and administrative support personnel. A more detailed discussion of these factors is presented in Appendix C.

Using the FY 78 budget request and IE Five Year Plan as a baseline, Table 4 shows the additional funding needed for phased implementation. The salary and benefits estimates are based on the number of additional people each year, taking into account more frequent salary increases (step and promotion) for new employees. The travel estimate is based

TABLE 3 - PROJECTED MANPOWER DISTRIBUTION

	78	79	80	81	82	83
REGION PERSONNEL						
ONSITE	35	46	111	133	152	153
TECHNICAL SUPPORT[1]	176	178	204	235	233	239
LCVIP	20	33	37	39	39	39
IN TRAINING	122	192	101	40	72	92
FUEL CYCLE	60	61	62	63	65	66
SAFEGUARDS	53	71	75	90	98	112
DIRECTION & ADMINISTRATION	147	174	180	208	244	254
REGION TOTAL	613	755	770	808	903	954
SPECIAL INSPECTION TEAMS						
INSPECTORS	27	50	74	97	97	97
ANALYSTS	7	13	19	23	23	23
SUPERVISION & ADMINISTRATION	8	15	26	37	37	37
SPECIAL INSPECTION TOTAL	42	78	119	157	157	157
IE HEADQUARTERS						
MANAGEMENT	52	52	50	54	56	60
PROGRAM DEVELOPMENT	84	105	127	128	128	128
HEADQUARTERS TOTAL	136	157	177	182	184	188
IE TOTAL	791	990	1,066	1,147	1,244	1,299

Note: 1 - Technical Support includes power reactor tech support, non-power reactor tech support, and support for incident response and 10 CFR 21 additional inspection requirements.

TABLE 4 ADDITIONAL BUDGET REQUEST

	Dollars (Millions)					
	78	79	80	81	82	83
SALARY AND BENEFITS	2.0	3.5	5.8	6.0	6.3	6.6
TRAVEL	1.8	2.1	0.9	1.0	0.8	0.9
ADMINISTRATIVE SUPPORT	1.0	2.0	2.3	2.3	2.4	2.5
TRAINING	0.5	0.5	0.5	0.5	0.5	0.5
CONTRACTOR SUPPORT	0.5	0.5	2.0	2.0	2.0	2.0
TOTAL	5.8	8.7	11.5	11.8	12.0	12.5

on the normal additional travel for new personnel and the additional travel associated with OJT for newly recruited inspectors; moves of inspectors to site locations; additional travel to cover sites temporarily until onsite inspectors are assigned; and the travel saved by placing inspectors onsite. Administrative support estimates are based on office facilities, equipment, supplies and services for the onsite inspectors. Training estimates are based on the additional courses that will be conducted under contract. Finally, contractor support estimates involve costs associated with validating the training and personnel qualifications/testing programs and providing additional confirmatory measurements support.

Implementation Planning

Implementation of an onsite inspection program will require prompt and decisive action on a number of key issues. Planning has already begun on some of these issues and, upon Commission approval, an intensive effort to complete them will be initiated. This effort will involve both Headquarters and Regional IE personnel as well as representatives from other NRC offices such as ELD, ADM and OIA. Small teams will be formed to establish work plans and schedules and to complete the tasks. Key implementation tasks to be addressed in this effort are:

Onsite Manning Schedule
Program Structure and Management
Regional Organization
Special Inspection Program
Inspection Duties
Training
Recruitment
Career Management
Conduct of Employees
Onsite Logistics Support and Personnel
Legal Aspects of Responsibilities and Authorities
Legal Aspects of Individual and Agency Liability
Impact on other NRC Offices
Enforcement Program
Licensee Impact
Program Re-evaluation

The following paragraphs identify the considerations to be addressed in each task.

Onsite Manning Schedule. Total IE resource requirements for implementation have been developed. Each Region must perform a site-by-site analysis to identify:

The order in which sites will be manned.

Those sites that can be manned without a physica- -ove.

Those sites that can be manned by existing Regio- personnel on a voluntary basis.

The number of onsite inspectors by reactor phase required during FY 78 - FY 83.

The number of technical support inspectors requi- ..

Results of the regional analyses must be consolidated and -e total IE resource estimates must be allocated to the Regions.

A summary of resource needs by skill type for each Regio- -.st be developed for use by the training and recruitment task fo- -s.

Program Structure and Management. The staff must develo- -'dance for administering and conducting the onsite, support, and -ecial inspection programs that defines the authorities, respons- -ities and roles of the Headquarters staff, regional onsite and t- -nical support personnel and special inspection personnel. This -'dance should cover the interplay among the components of the ins- -ction program.

Supervision of remote, dispersed personnel must ensure ad- -ence to inspection requirements, continued objectivity with respe- to licensees and maintenance of inspector competency. There must be a - stem of checks and balances within the program to ensure periodic -depth examination of program effectiveness. This sytem must di- -tly probe licensee control systems and indirectly evaluate the perfo- -nce of the onsite program.

The program must ensure timely reporting of significant i- by onsite, technical support and special inspectors and time- -ttention to and disposition of these items by Regional and Headqua- -s management. Regional onsite and special inspection experience m- - be incorporated into the program development process.

The program must be well-defined to assure uniform treatme- of comparably performing licensees but permit enough flexibi- - to accommodate different licensee facilities and performance. That is, the program must be detailed enough to assure that there a- no significant differences in implementation among the Regions, but -exible enough to respond to unexpected situations and to account -- licensee and facility differences.

Regional Organization. The growth and dispersement of reactor inspectors and the addition of a special inspection program may affect the number of Regional Offices, their internal organization or both. A task force will review these considerations, recognizing recent Commission interest in Regional expansion.

Special Inspection Program. The special inspection program must be structured to provide checks and balances to ensure the routine inspection program is performing as intended. This component will bring a perspective to the inspection program that is oriented toward the total control of licensed activities and transcends regional boundaries. To achieve this, the performance appraisal and direct verification/measurement teams will conduct their activities from a support office reporting directly to the Director, IE.

The appraisal teams will be led by experienced inspectors supplemented by staff members skilled in the disciplines required for the specific areas inspected. The teams will normally consist of three to five individuals who would spend about five days at a licensed facility.

The special inspection teams will possess independent measurement capability for verification of licensee performance. NRC inspectors supplemented by contractor support will perform various measurements or activities for comparison with previous licensee measurements or activities. The direct verification/measurement capability will also be available to the Regional Offices to enlarge their independent measurement activity.

In addition to appraising licensee performance, the results of special inspections will indicate the effectiveness of the onsite program. These inspections should help maintain inspector objectivity.

Duties of Onsite and Technical Support Inspectors. The division of labor between onsite and regional technical support inspectors must ensure effective and efficient use of highly specialized technical support experts and of the onsite inspector generalists. The program should maximize the ability to directly observe licensed activities and perform some confirmatory measurements but should not sacrifice the broad view of licensee operations obtained through the review of records.

A task force has completed a first draft of onsite inspector duties for the construction, test and startup and operations phases. Upon Commission approval, the onsite duties will be refined and complementary technical support duties developed.

In addition to the technical onsite duties, the authority and responsibility of the inspector must be defined. This task will be coordinated with the legal considerations.

Training. The qualifications required for onsite inspectors and the methods of verifying these qualifications must be developed. Preliminary training estimates have indicated a two-year training period. The program builds on the current IE training and consists of classroom and simulator activities, on-the-job training and formalized self-study programs. The establishment of courses, schedules and training requirements has begun and will accelerate upon approval.

Recruitment. To ensure smooth implementation, recruitment needs must be identified and coordinated with the specific phasing requirements and training schedules. Once needs are identified, an aggressive recruitment and personnel processing (including security clearances) program must follow. Issues such as length of duty assignment, reassignment considerations, reimbursement expenses for relocation and duty hours must be defined for the onsite program. New employees must be informed of policy concerning onsite assignment to minimize attrition.

Career Management. The onsite inspection program will bring personnel at different age levels and with different knowledge and work experience to IE. To assign work responsibilities and to provide a better approach to career development, several inspector classifications will be used. These classifications, sequence of progression, grade levels and types of assignments must be established in a career development path. Preliminary work has begun in this area.

Conduct of Employees. Assigning inspectors to often remote reactor sites presents a new set of considerations with respect to the conduct of employees. Particular care must be given to avoiding any appearance of or actual conflict of interest while minimizing personal sacrifices from inspectors or their families. The NRC must re-examine the conduct expected of employees recognizing any legal constraints on employees; the impact that living in communities near licensed facilities might have on inspectors and their families; and other potential problems that could result from moving toward the resident concept.

Onsite Logistics Support and Personnel Administration. The Trial Resident Inspection Program identified logistics support and personnel administration issues related to the resident concept. These issues include space requirements, utilities, office equipment, transportation, relocation reimbursement, administrative assistance and leave and sick time. Region III has identified a preliminary list of considerations in this area and will work with IE Headquarters and Administration personnel to complete planning in this area.

Legal Aspects of Responsibilities and Authorities. An initial examination of the provisions contained in the Atomic Energy Act indicates that the onsite inspection program would not be in conflict with the regulatory role of the NRC. The Act also provides authority for NRC to perform the necessary studies and investigations. However, changes to the regulations may be required to provide free and unaccompanied access to licensed facilities. A more detailed review of the applicable legislation and regulations is needed to determine whether all elements of alternative 3 are consistent with NRC's responsibilities and authorities.

Legal Aspects of Individual and Agency Liability. Although the duties of onsite and other inspectors have not yet been completely defined, they may involve increased inspection responsibility and flexibility. If so, the NRC and individual inspectors may be open to increased liability with respect to interference in licensee operations. A careful assessment of the liabilities potentially incurred in this program must begin.

Impact on Other NRC Offices. The implementation and operation of alternative 3 will have resource impacts on other NRC offices. A number of offices have identified preliminary estimates of the additional manpower required as a result of the full time onsite program. As part of the implementation planning, other NRC offices must refine these estimates and determine the total resource impacts on their programs.

Enforcement Program. The onsite program may affect the enforcement program but the magnitude and nature of any impact has not yet been determined. The resident concept and its implications for the enforcement program will be addressed in the on-going contractor and in-house studies of enforcement and incentives.

Licensee Impact. NRC must begin to inform licensees of the nature and intent of the onsite inspection program. Licensee feedback should be secured to minimize the impact on licensee operations.

Program Re-evaluation. While implementation planning proceeds, a plan for evaluating program performance must also be developed. This plan should identify criteria against which program performance can be measured and should specify the measures of performance to be evaluated. An initial re-evaluation of the program should be performed no later than 18 months after inspectors begin onsite assignments.

APPENDICES

APPENDIX A

Resource Requirements for Alternatives 1-5

For evaluation purposes, full program implementation is assumed at the end of FY 81. The current reactor inspection program requires routine and non-routine effort that is provided by project inspectors and technical support inspectors. The amount of onsite time that is required varies by phase of the program. Table A-1 shows these requirements on an annual basis. Manpower requirements for the various alternatives are based on the inspection manhours required and on the number of sites or reactors in various phases. Table A-2 shows the current forecast of facilities for the time frame considered.

TABLE A-1

ONSITE REACTOR INSPECTION MANHOURS PER SITE PER YEAR

CURRENT PROGRAM REQUIREMENTS

Reactor Phase	Project[1]	Tech Support[1]	Non-Routine	HP/Envir[3]	Total
Pre Cp	60	30	0	0	90
Construction					
Single Reactor	170	260	70	0	500
2 Reactors	295	450	120	0	865
3 Reactors	420	640	170	0	1230
4 Reactors	545	830	220	0	1595
5 Reactors	670	1020	270	0	1960
PreOps/Reactor[2]	0	535	135	210	880
Startup/Reactor[2]	0	550	140	60	750
Operations					
Single Reactor	210	170	100	340	820
2 Reactors	315	255	150	510	1230
3 Reactors	420	340	200	680	1640
4 Reactors	525	425	250	850	2050

Note: 1. Projects/Tech Support Ratios are: .4/.6 Construction
.55/.45 Operations

2. Two year period assumed for Preops, one year for Startup.
3. HP/Envir - Health physics radiological protection and environmental inspections.

TABLE A-2 REACTORS AND REACTOR SITES BY REACTOR PHASE FOR FY78-83

REACTOR PHASE	Number of Reactors Per SITE	1978		1979		1980		1981		1982		1983	
		Sites	Reactor	Sites	Reactor	Sites	Reactor	Sites	Reactor	Site	Reactor	Sites	Reactor
Pre CP			62		61		62		55		44		40
Construction	1	23	101	19	103	24	107	24	110	19	107	16	112
	2	28		31		29		31		37		43	
	3	3		3		3		4		2		2	
	4	2		2		4		3		2		1	
	5	1		1		0		0		0		0	
Preops	1	14	20	12	22	16	26	18	24	21	35	15	50
	2	3		5		5		1		7		16	
	3	0		0		0		0		0		1	
	4	0		0		0		1		0		0	
Startup	1	6	8	6	10	8	10	11	11	13	15	7	9
	2	1		2		1		0		1		1	
Operations	1	31	77	31	87	37	97	40	108	38	123	37	132
	2	17		22		24		25		30		33	
	3	4		4		4		6		7		7	
	4	0		0		0		0		1		2	
Totals*		98	178	103	190	111	204	117	218	125	230	132	244

* The Sites per phase do not total to total sites due to the mix of reactors by phase at various sites. The Site total corresponds to all sites that have reactors in any phase 2-5.

Table A-3 combines Tables 1 and 2 show the annual onsite manhours required to accomplish the current program in FY 81. Non-routine workload has been included with technical support because it generally requires specific skills.

TABLE A-3
FY 81 ONSITE REQUIREMENTS

	Project	Non-Routine and Tech Support	H.P/ Envir.
Pre-CP	3300	1650	0
Const	16540	31980	0
Pre-Ops	0	16080	5040
Startup	0	7590	660
Operations	18795	24165	30430

Alternative 1: Current Program

Analysis of historical manpower data shows that one inspector typically provides 500 onsite man-hours per year. (Actual data for the past year shows 493 hours.) Dividing Table A-3 entries by this factor yields the number of inspectors needed to perform the current program (Table A-4). In addition to this manpower, safeguards inspectors are also required at power reactors. The number shown is taken from the current Five-Year Plan.

TABLE A-4
FY 81 REACTOR INSPECTION MANPOWER

Pre-CP	10
Const	97
Pre-Ops	32
Startup	15
Operations	86
Environmental H. P.	72
Safeguards	38
TOTAL	350

This FY 81 projection of 350 inspectors for power reactors is 23 less than the projection in the current IE Five Year Plan. The difference is because of the more detailed analysis of reactors by phase shown in Table A-2. Table A-2 was developed from a more recent Reactor Five Year Forecast than was available when the Five Year Plan was submitted.

Alternative 2: Site Vicinity Inspections

The Trial Resident Inspection Program recommended locating an NRC inspector near clusters of three or more operating reactors within a radius of approximately 25 miles. The evaluation of the trial program further concluded that vicinity inspectors would be appropriate at a single or multi-unit facility during test and startup, and that nothing was identified to suggest that the concept would not be applicable to reactors under construction.

In alternative 2, vicinity inspectors are considered when there are two or more sites in construction, test and startup, or operation within a radius of 50 miles. These criteria were chosen because single site multi-reactor inspectors are explicitly treated under alternative 3 and because the 50 mile radius is a reasonable commuting distance for periodic visits.

There are 11 clusters in FY 81 using these criteria. Of these, eight clusters will contain sites in operation only, and three will contain sites that have reactors in various phases of construction, pre-op or startup testing, or operation. These clusters are shown in Figure A-1. Figure A-2 contains the geographical distribution of plants from which these clusters were selected. Resource calculations are based upon the two types of clusters: mixed construction and operating reactors; and pure operating reactors. One vicinity inspector is placed at each "pure" cluster and two are placed at the "mixed" cluster. The workload accomplished by vicinity inspectors consist of three components (1) all current program project type workload; (2) up to 50% of the current program technical support workload; and (3) direct observation and evaluation of licensee activities. Regional manpower requirements are then based on the technical support workload that remains for these sites and the total workload for sites without a vicinity inspector.

FIGURE A-1 SITE VICINITY CLUSTERS (± 50 mile radius)

		Phase*
1.	Browns Ferry 1-3	5
	Bellefonte 1, 2	5
2.	Connecticut Yankee	5
	Millstone 1-3	5
3.	Dresden 1-3	5
	Zion 1,2	5
4.	Quad Cities 1,2	5
	Byron 1.2	5
5.	LaSalle 1,2	5
	Braidwood 1,2	3,4
6.	Waterford 3	4
	River Bend 1,2	3
7.	Cook 1,2	5
	Palisades 1	5
8.	Monticello	5
	Prairie Island 1,2	5
9.	Nine Mile Island	5
	FitzPatrick	5
10.	Kewaunee	5
	Point Beach 1,2	5
11.	Calvert Cliffs 1,2	5
	Douglas Point 1,2	2

* Reactor Phases: 2 Construction
3 Preoperational Testing
4 Startup Testing
5 Operations

NRC REGIONAL OFFICES AND COMMERCIAL NUCLEAR POWER REACTORS IN THE UNITED STATES

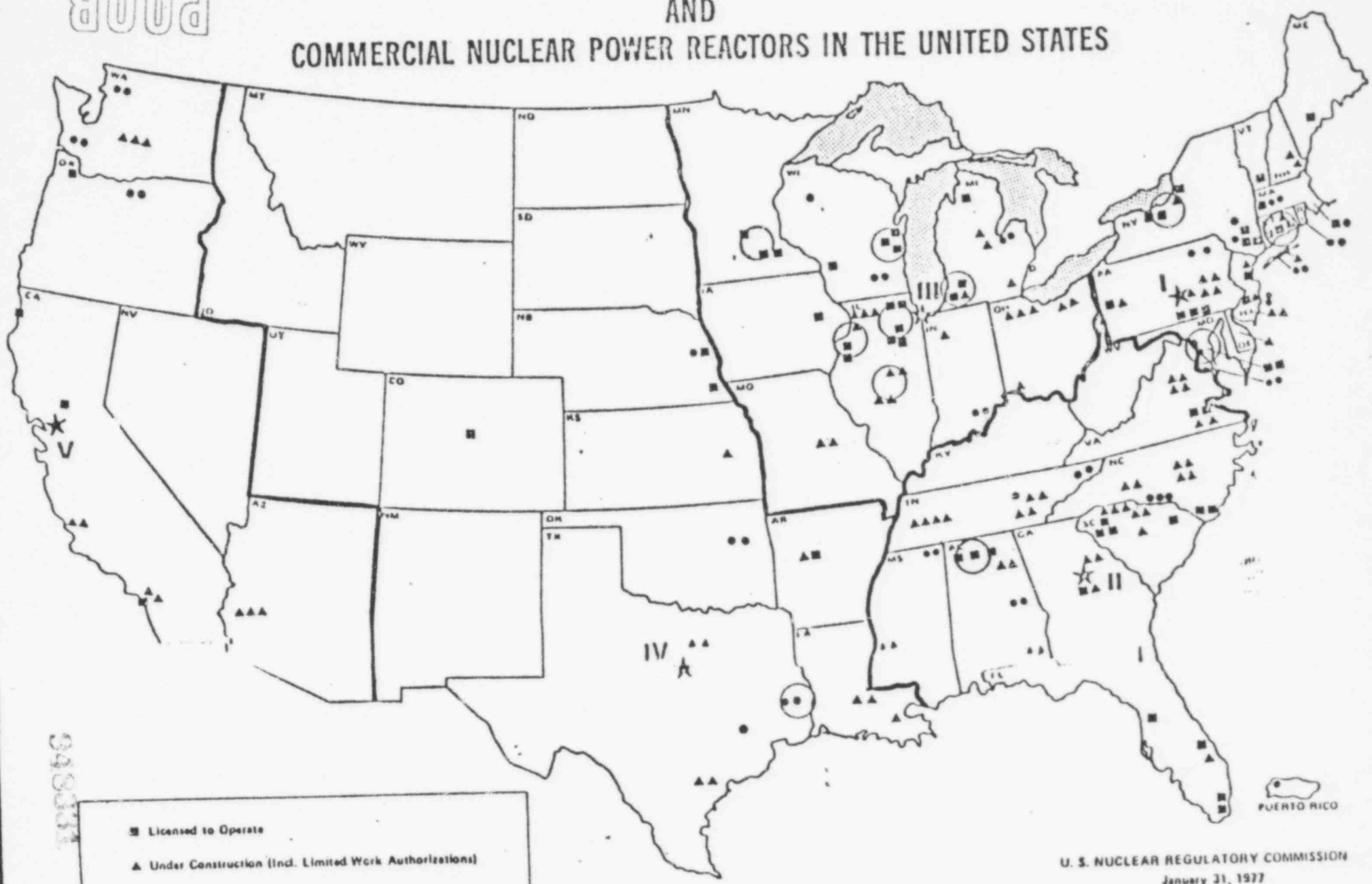


Figure A-2

Table A-5 shows the number of inspectors required for this option.

TABLE A-5

INSPECTOR REQUIREMENTS - FY 81 "SITE VICINITY"

	Regional Inspectors	Site Vicinity Inspectors	
Pre-Cp	10	0	
Construction	96	1	
Pre-Ops	30	2	
Startup	13	2	
Operations	83	8	
Environmental	72	0	
Safeguards	38	0	
TOTALS	342	13	355

Alternative 3: Full Time Onsite Inspectors

The required number of onsite inspectors is derived from the number of sites with reactors in distinct phases as shown in Table A-2. Inspectors are placed at all sites where Pre-Ops (20) and Startup Testing (11) are in progress since these phases are very important check points. Some pre-operational testing begins 18 months to 2 years prior to the issuance of an operating license. Construction will still be in progress at these sites. Thus, the number of construction sites (62) shown in Table A-2 includes the 20 pre-ops sites. In these cases it is assumed that the pre-ops inspectors will be able to cover the construction work as well. This leaves 42 sites that have only construction in progress. An inspector will be stationed at each of these. In a similar fashion, when a plant is licensed there is a period of approximately one year for startup. The startup inspectors will cover the operations activity at these sites. This leaves 60 sites where an operations inspectors must be located. This mix requires 133 inspectors at the 117 sites as shown in Table A-6.

TABLE A-6

ONSITE INSPECTORS - FY 81

	No. Reactors/Site				
	1	2	3	4	Total
Construction	13	27	1	1	42
Preops Testing	18	1	0	1	20
Startup Testing	11	0	0	0	11
Operations	34	22	4	0	60
TOTAL					133

The regional manpower required to complete program workload can be estimated by subtracting the workload onsite inspectors accomplish from the total program requirements shown in Table A-3. The remaining workload is divided by 500 to obtain the number of regional support inspectors since regional inspectors spend close to 500 hours per year onsite. To obtain the regional workload, it was assumed that the onsite inspector for construction and operations sites could perform all of the work and 50% of the non-routine and technical support work. For the Preops and Startup phases, it was assumed that the onsite inspector could perform 75% of all the work except the health physics portion. The health physics specialty work would be totally based in the Regions. The onsite inspector would complete a maximum of 700 hours per year of the current inspection program. Using these assumptions with the location of the 133 onsite inspectors and Table A-1 data, Table A-7 shows the annual program requirements.

TABLE A-7

FY 81 INSPECTION PROGRAM MANHOURS

Phase	Total Hours	Onsite Hours	Region Hours	Reactor Tech. Supp. Inspectors	HP/ Tec Ins
Const	48,520	12,415	27,105	54	
Pre-Ops	21,120	10,060	11,060	17	
Startup	8,250	5,698	2,552	4	
Operations	73,390	25,886	47,504	30	
TOTALS	151,280	63,059	88,221	105	

In addition to the 177 inspectors shown above, the Regions require 10 inspectors for the Pre-CP workload shown in Table A-3. The Regions must also coordinate the work at the sites, regional inspections, training Headquarters assignments, and other liaison type activity. This work will require travel to each site three times per year for one week. Since an inspector can make 12 visits each year at 40 hours per visit, one inspector should be able to handle 4 sites. For 117 sites, this would require 30 additional inspectors, 11 for construction sites and 19 for operating sites. Table A-8 summarizes these requirements.

TABLE A-8
SITE AND REGION INSPECTOR REQUIREMENTS
(FULL TIME ONSITE - FY 81)

	Regional Inspectors	Onsite Inspectors	
Pre-CP	10	0	
Construction	0	42	
Pre-Ops	0	20	
Startup	0	11	
Operations	0	60	
Inspection Support			
Coordination	30	0	
Tech Support	177	0	
Safeguards	38	0	
TOTALS	255	133	388

Alternative 4: Continuous Onsite Inspectors

Inspector requirements for this alternative are also based upon the number of sites and the phase of each shown in Table A-2. Regional inspectors would continue to conduct all Pre-CP inspections. For reactors under construction or in preoperational test one shift coverage is considered to suffice, since these are basically single shift operations. For reactors in these phases, the onsite inspectors would perform the same duties as their alternative 3 counterparts.

For reactors in startup testing or in operation, three shifts of coverage are required. Onsite inspectors at these facilities would accomplish the complete reactor inspection program. Five inspectors would be required to provide three-shift coverage. This is based on 21 shifts per week, 5 shifts per inspector and needed overhead (leave, sickness, etc.) A supervisor is required for the five inspectors.

For startup and operations phases, this alternative does not require inspection support from the Regions, because the six inspectors assigned to each site could be chosen to include all the required expertise. Also, if one of the five inspectors is a health physicist and one is a safeguards inspector, these two inspectors could accomplish the full reactor health physics and safeguards inspections with no regional support. Site coordinators are still required in the Regions at the rate of one coordinator for four sites.

Table A-9 summarizes the inspector manpower requirements for this option.

TABLE A-9
INSPECTOR REQUIREMENTS - FY 81 (Continuous Onsite)

	Regional Inspectors	Onsite Inspectors	
Pre-Cp	10	0	
Const	0	42	
Pre-Ops	0	20	
Startup	0	66	
Operations	0	360	
Coordination	30	0	
Tech Support	77	*	
Safeguards	10	*	
TOTALS	127	488	615

*H.P. and Safeguards inspectors included in startup and operations onsite teams.

Alternative 5: Continuous in Control Room

As a minimum, five inspectors are required to provide control room coverage for 21 shifts per week. This estimate is conservatively low because it assumes one inspector can stand an eight hour shift. While this may be true, experience indicates that a four hour shift is more reasonable and that nine inspectors are required. To remain conservative, this analysis considers only 5 control room inspectors per control room. In FY 81 there will be 108 operating reactors with 11 of these in startup testing. A control room inspector is assumed to be stationed at each reactor even though a control room may be shared by more than one reactor, because of the current trend toward isolating reactor consoles. Continuous coverage for the 97 operating reactors requires 485 inspectors and similar coverage for the 11 reactors in startup requires 55 inspectors. Since this option does not provide a means of conducting the routine inspection program, but rather is designed to augment that program, the control room inspector could be added to the baseline current program or to any of the alternatives. In practice, however, it is not reasonable to consider adding this option to any alternative other than 3 because of resource implications. Table A-10 shows inspector requirements for alternative 3 (Table A-7) plus control room inspectors.

TABLE A-10

INSPECTOR REQUIREMENTS - FY 81 ONSITE CONTROL ROOM

	Regional Inspectors	Onsite Inspectors	
Pre-Cp	10	0	
Const	0	42	
Pre-Ops	0	20	
Startup	0	11	
Operations	0	60	
Control Room		540	
Inspection Support Coordination	30	0	
Tech Support	177	0	
Safeguards	38	0	
TOTALS	255	673	928

Special Inspection Teams

Appraisal inspections must be performed frequently enough to serve as a credible incentive. For resource estimation, one inspection per site per year for each reactor phase; construction, preoperational or startup test, or operation, represented at the site is assumed. Current program experience suggest that a team may spend one week preparing for an inspection, one week conducting the inspection and two weeks preparing reports and follow-up documentation. Inspectors presently use approximately 25% of available time for leave, sickness, training etc., leaving 39 man-weeks/year for inspection workload. Each team, then, will be able to accomplish ten performance appraisal inspections per year. Table A-2 showed the number of sites per phase in FY 81. With one inspection per site and 10 annual inspection per team, Table A-11 shows the number of teams required.

TABLE A-11
APPRAISAL TEAMS - FY 81

Const	6
Pre-Ops	3
Startup	1
Operations	7

The composition of the teams will vary by phase. For construction sites, the team will consist of a leader, a quality assurance specialist, and three (3) technical specialists. For operations, a leader, an operations specialist and three (3) technical specialists are required. For pre-operations and startup testing a leader and two testing specialist will be required. Combining Table A-11 with these teams sizes yields Table A-12.

TABLE A-12
PERSONNEL REQUIREMENTS - FY 81 APPRAISAL TEAMS

Const	30
Pre-Ops	9
Startup	3
Operations	35
TOTAL	77

Confirmatory measurements are to be conducted by one IE inspector as a leader and two contractor personnel who furnish special expertise, equipment and/or analysis. One inspection is conceived to be one week in length, therefore, each inspection represents 40 man-hours of IE inspector resources. It is reasonable to anticipate that there would be a requirement for use of this capability in conjunction with the annual appraisal inspection. Assuming further that the Regions would call upon this capability one additional time per year for each site yields two confirmatory measurement inspections per site per year. These measurements would apply only to construction and operating sites, since sites either in pre-operations or startup testing offer sufficient opportunities for independent observation to preclude the need for these measurements. Also, it may not be appropriate for NRC inspectors to conduct "hands on" activities during active licensee test periods. Based on Table A-2, there are 133 construction and operations sites to be inspected for a total of 266 inspections per year.

Table A-13 summarizes the sites, inspections and IE inspector-hours required.

TABLE A-13
CONFIRMATORY MEASUREMENT - FY 81 PERSONNEL REQUIRED

	Inspections per year	Sites	Total Insp	IE Insp-Hours per Insp	Total Insp-Hou Required Onsi
Construction	2	62	124	40	4960
Operations	2	71	142	40	5760
TOTALS	4	133	266	80	10720

Assuming a confirmatory measurement inspector can spend 500 onsite hour per year brings the total IE requirement to 20 inspectors.

The special team inspections will be closely tied to performance evaluations of licensee supplied information and inspection results. It is assumed that one man-month of performance analysis support is needed for each reactor in startup or operations each year. For the startup and operating reactors in FY 81, this amounts to 108 man-months of analysis. It is further assumed that one-half man-month per year is required for sites in pre-ops or under construction. For the 62 sites in FY 81, 31 man-months are required. With 9 man-months/year of productive direct labor, 16 performance analysts are required. In addition, these performance evaluations

will require the support of one statistician, one reliability analyst and five data system support personnel (one per Region) for a total of 23 personnel. The special inspections require performance appraisal inspector (77), confirmatory measurement inspectors (20) and performance evaluation analysts (23) for a total of 120 people. Thus, a new division office will be required. This will involve a Division Director, Deputy, three Branch Chiefs and three Section Chiefs in each branch (14 supervisors). Each supervisor will require a secretary and each section will require an additional clerk typist (23 administrative).

Contractor personnel (2 per team) will provide one week onsite time and one week for preparation and wrap-up. Thus, 1064 man-weeks of contractor direct labor is required to accomplish the 266 inspections per year. Assuming 45 man-weeks of direct labor per man-year results in 24 man-years of contractor effort required each year. At $80,000 per man-year, $1.9 million of contractor effort is required.

Support Resources

Table A-14 summarizes additional IE support personnel required for each alternative.

TABLE A-14
FY 81 SUPPORT PERSONNEL ADDITIONS

	Alternative				
	1	2	3	4	5
Training	-	10	13	32	58
Region Admin	-	1	10	(44)	(9)
Onsite Admin	-	-	-	71	71
HQ Admin	-	-	4	4	4
TOTALS		11	27	63	124

( ) indicate negative numbers

The following paragraphs discuss the derivation of these numbers.

Training. The additional inspectors present a need for augmented training resources. Currently, each instructor accomplishes 52 inspector manweeks of training. Assuming this yield can be maintained in the future, the additional inspectors (Table 1, Section III) times three weeks of annual training creates a need for 6, 8, 21, 39 additional instructors for alternatives 2, 3, 4 and 5 respectively. As instructors are increased in this manner there is a need for additional supervisors and administrative support. The training additions are summarized in Table A-15.

TABLE A-15 ADDITIONAL TRAINING PROGRAM NEEDS

	Alternatives				
	1	2	3	4	5
Instructors	-	6	8	21	39
Supervisors	-	2	2	4	6
Administrative	-	2	3	7	13
TOTALS	-	10	13	32	58

Regional Administrative Support. In FY 77, there are 369 inspectors for each administrative support position. Additional administrative personnel required for each alternative are estimated by dividing the additional inspectors (from Table 1 Section III) by this ratio. This results in one additional person for alternative 2, ten for alternative 3, 44 less for alternative 4, and nine fewer for alternative 5.

Onsite Administrative Support. There will be 133 inspectors at 117 distinct sites in FY 81 for alternative 3. They will require clerical assistance to handle mail, filing and typing. Ten hours of this assistance per week will be provided on a temporary hire basis. For 133 inspectors, approximately 34 temporary positions per year will be needed. For alternatives 4 and 5 one full time admin person is located at each of the 71 sites that are staffed for continuous coverage.

HQ Administrative Support. No additional headquarters personnel are required for alternatives 1 and 2. For alternatives 3, 4 and 5, four administrative support personnel are required: one to coordinate logistics arrangements, one to handle the coordination with GSA that will be required and two clerk typists.

Costs. Total dollar requirements are constructed as shown in Table A-16.

TABLE A-16 FY 81 TOTAL COSTS ($ MILLIONS)

	Alternatives				
	1	2	3	4	5
Salary & Benefits	31.1	36.0	37.6	46.3	58.6
Travel	3.8	4.6	4.8	5.9	7.4
Admin Support	2.35	2.65	4.65	5.75	4.65
Contract Support	5.1	7.3	7.6	8.2	9.1
Equipment	.75	.75	.75	.75	.75
TOTALS	43.1	51.3	55.4	66.9	80.5

Salary and benefits expenses are estimated based on an average salary of $32,840 per annum (FY 81 FYP $31.1 M divided by 947 employees). Travel expenses use the FY 81 FYP estimates as a base and adds $4,150 per new employee. Administrative support costs use the FY 81 current program base and add the dollars needed for onsite facilities and temporary administrative personnel. Trailers will be furnished with office equipment for the inspector(s) and a clerk typist. Separate telephone lines, copy machine, telecopy machine and phone answering device will be furnished. Assuming a trailer lease ($2700), utility and phone cost ($6600) and equipment/supplier ($5000), the annual facility support cost is $14,300. For 117 sites, this amounts to about $1.6 M annually. Contract support is estimated based on the FY 81 current program base with additional training courses, confirmatory measurements and program evaluation contracts. It should be noted that the cost of training courses may be underestimated for alternative 5 if control room inspectors require training substantially beyond that normally envisioned for inspectors.

by 400 onsite hours each. Confirmatory measurement inspectors (20) are assumed to provide as many onsite hours per year as Regional inspectors, 500 each. Table II-1 summarizes the total onsite hours provided by each type of inspector. The number of inspectors of each type is shown in Appendix A.

TABLE II-1 ANNUAL ONSITE HOURS BY TYPES OF INSPECTOR (FY 81)

	1	2	3	4	5
	Current Program	Site Vicinity	Full-Time Onsite	Continuous Onsite	Control Room
Regional Inspectors	175,000	171,000	127,500	63,500	127,000
Site Vicinity Inspectors	-	7,800	-	-	-
Onsite Inspectors	-	-	207,480	96,720	207,480
Continuous, Startup/Operations	-	-	-	621,960	-
Continuous, Control Room	-	-	-	-	946,080
Performance Appraisal	-	30,800	30,800	30,800	30,800
Confirmatory Measurement	-	10,000	10,000	10,000	10,000
TOTALS	175,000	219,600	375,780	822,980	1,321,360

APPENDIX B

INSPECTOR ONSITE PRESENCE

Because of increased opportunity for independently verifying licensee activities and increasing the knowledge base for technical decisions, the inspection alternatives examined include various ways of increasing onsite time. In the current program, inspectors typically spend 500 hours/year onsite. This, multiplied by the number of regional inspectors required for each alternative gives the total annual onsite hours expected from regional inspectors. Placing inspectors near clusters of facilities would reduce their travel time by at least one-half and allow them to spend this time onsite. The total onsite time available to each site vicinity inspector then would be 600 hours annually. The number of inspectors (13) multiplied by the time available provides their annual onsite time.

More onsite time enhances the interaction between the NRC inspector and the facility staff. Although all working time may not be spent in direct inspection of licensee operations, the presence of an inspector on a site provides the opportunity for contact between the NRC and licensee personnel and encourages awareness of regulatory requirements on the part of licensee management. Therefore, any time an onsite inspector is actually present at the site is considered to be onsite time. Approximately 25% of an inspector's annual available time is spent on leave, in training or otherwise unavailable. The remaining hours, 1560 per year per onsite inspector, multiplied by the number of inspectors gives the total onsite time. This method is used for determining the onsite time provided by all onsite inspectors in alternative 3, since full time coverage is provided during all reactor phases; and for onsite inspectors covering the construction and pre-ops phases in alternative 4, because their coverage is essentially the same as that in alternative 3.

Alternative 4 provides continuous coverage during startup and operations. To determine the onsite hours provided by NRC inspectors, the number of sites covered (71) is multiplied by 24 hour/per day coverage for 365 days per year. Onsite hours provided by control room inspectors in alternative 5 is also determined by multiplying the number of control rooms (108) by the total number of hours per year.

Performance appraisal inspectors conduct 10 inspections per year for 40 onsite hours per inspection. Therefore, the annual onsite hours provided by these inspectors results from multiplying the number of inspectors (77)

APPENDIX C

PHASED MANPOWER - ALTERNATIVE 3

It is estimated that 18 sites are located close enough to the Regional Offices to provide an onsite inspector without a physical move of the inspector's home. It is further estimated that 17 current inspectors would be amenable to a move to an onsite location in FY 78, Thus, 35 (of 98) sites could be covered by full-time onsite inspectors in FY 78. Assuming two (5%) of these inspectors are lost to attrition in FY 79 and that 13 more move to the sites, 46 sites (of 103) could be covered in FY 79. In FY 80, the first group of recruits will become eligible for onsite assignment. Assuming two onsite inspectors are again lost to attrition, moving 67 of these two-year inspectors will provide full time onsite coverage at each of the 111 sites. In FY 81, 27 moves will be required to replace attrition and bring the onsite inspector force to the 133 inspectors needed for 117 sites. Onsite staffing for future years then becomes a matter of replacing attrition and satisfying new requirements.

At the end of FY 77, there will be approximately 153 reactor operations and construction inspectors (excluding non-power reactor inspectors and health physics inspectors) on board in the Regions. It is estimated that 15% of this workforce will be lost to attrition each year (except those assigned onsite). This attrition, coupled with the placement of 35 of those inspectors onsite in FY 78 and 13 more in FY 79, causes significant reduction in the experienced workforce in the Regions which must provide technical support and coordination for onsite inspectors. A number of inspectors must be recruited in FY 78 to supplement those remaining from the current workforce and bring the regional support inspector strength back up to the level required for full implementation in FY 81.

In addition to phasing in the inspectors required for onsite and regional duty, the training organization must be staffed to cope with an increased training workload; the special inspection teams must be built and appropriate Headquarters and Regional administrative support must be added. To attain implementation by FY 81, the training staff must be augmented immediately (13 positions, Appendix A). Also the ten administrative support positions in the Regions and the four Headquarters positions identified in Appendix A must be added in FY 78 to handle the influx of new employees and the administrative details

associated with establishing the site offices. Recruitment of inspectors, analysts, supervisory and administrative support personnel for the special inspection teams is phased gradually throughout the FY 78 - FY 81 time frame.

The final consideration in determining phased manpower requirements is attrition. It is estimated that 15% of the new recruits will be lost to attrition in each year so that initial recruitment is inflated to accommodate these losses.