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# NUCLEAR ENERGY

## NRC's Workforce and Processes for New Reactor Licensing Are Generally in Place, but Uncertainties Remain as Industry Begins to Submit Applications





Highlights of [GAO-07-1129](#), a report to congressional committees

## Why GAO Did This Study

Nearly three decades after the last order for a new nuclear power reactor in the United States, electric power companies plan to submit 20 applications in the next 18 months to the Nuclear Regulatory Commission (NRC) for licenses to build and operate new reactors. Since 1989, NRC has developed a new license review process that allows a power company to obtain a construction permit and an operating license through a single combined license (COL) based on one of a number of standard reactor designs. NRC expects its new process to enhance the efficiency and predictability of its reviews. GAO reviewed NRC's readiness to evaluate these applications by examining the steps NRC has taken to (1) prepare its workforce and manage its workload and (2) develop its regulatory framework and review process for new reactor activities. GAO reviewed NRC documents for new reactor workforce staffing and training, examined NRC's guidance for the review of license applications, interviewed NRC managers and representatives of nearly all of the COL applicants, and observed NRC's public meetings.

## What GAO Recommends

GAO is making recommendations to better ensure that NRC's workforce and review processes efficiently and effectively facilitate the review of new reactor license applications. In commenting on a draft of the report, NRC agreed with GAO's recommendations.

To view the full product, including the scope and methodology, click on [GAO-07-1129](#). For more information, contact Mark Gaffigan at (202) 512-3841 or [gaffiganm@gao.gov](mailto:gaffiganm@gao.gov).

## NUCLEAR ENERGY

# NRC's Workforce and Processes for New Reactor Licensing Are Generally in Place, but Uncertainties Remain as Industry Begins to Submit Applications

## What GAO Found

NRC has taken many steps to prepare its workforce for new reactor licensing reviews, but several key elements of its preparations are still underway. As a result, uncertainties remain about NRC's ability to manage its workload associated with the surge of applications. Specifically, NRC has increased its funding for new reactor activities, created the Office of New Reactors and reorganized several other offices, and hired a significant number of entry-level and midlevel professionals. To assist its staff in reviewing the applications, NRC also plans to contract out about one-third of its fiscal year 2008 workload. However, several elements of NRC's preparatory activities are still in progress, including hiring for some critical positions; developing key training courses; and developing computer-based tools intended to enhance consistency and coordination in reviewing like sections of COL applications. In addition, NRC has not fully developed criteria for setting priorities if the workload exceeds available staff and contractor resources. Finally, while the Office of New Reactors established a cross-divisional resource management board early in 2007 for coordinating certain office review activities, it has not clearly defined the extent of the board's responsibilities.

NRC has significantly revised its regulatory framework and review process to prepare for licensing new reactors, but until NRC completes certain additional actions, it may not fully realize the anticipated benefits of the new process. NRC has revised, augmented, and clarified most rules, guidance, and inspection oversight criteria to provide for early resolution of issues, standardization, and predictability in the license review process. However, NRC has not yet completed several actions to implement this process. For example, NRC only recently modified its acceptance review process to include an evaluation of the application's technical sufficiency in addition to its completeness. NRC plans to complete new acceptance review guidance and tools reflecting this change by the end of September 2007. NRC also is refining its process for tracking requests to each applicant for more information but has not developed a coordinating mechanism to avoid unnecessarily requesting information from multiple applicants.

### Anticipated COL Applications by Fiscal Year

Expected submission date	Number of applications	Number of reactor units
First quarter, FY 2008	5	9
Second quarter, FY 2008	4	6
Third quarter, FY 2008	1	1
Fourth quarter, FY 2008	4	6
FY 2009	6	9
<b>Total</b>	<b>20</b>	<b>31</b>

Source: NRC.

Note: Information as of September 10, 2007.

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## Abbreviations

ABWR	Advanced Boiling Water Reactor
AP1000	Advanced Passive 1000
CIP	Construction Inspection Program
COL	combined license
DOE	Department of Energy
ESBWR	Economic Simplified Boiling Water Reactor
ESRP	Environmental Standard Review Plan
FTE	full-time equivalent
IMC	inspection manual chapter
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria
NRC	Nuclear Regulatory Commission
NRO	Office of New Reactors
RAI	request for information
SRP	Standard Review Plan
U.S. APWR	Advanced Pressurized Water Reactor
U.S. EPR	Evolutionary Pressurized Water Reactor

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United States Government Accountability Office  
Washington, DC 20548

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September 21, 2007

The Honorable Barbara Boxer  
Chairman  
The Honorable James M. Inhofe  
Ranking Member  
Committee on Environment and Public Works  
United States Senate

The Honorable Thomas R. Carper  
Chairman  
The Honorable George V. Voinovich  
Ranking Member  
Subcommittee on Clean Air and Nuclear Safety  
Committee on Environment and Public Works  
United States Senate

Nearly three decades after the last order was placed for a new civilian nuclear power reactor in the United States, electric power companies are again showing interest in nuclear power. This interest reflects the nation's growing demand for electricity, which will require the addition of substantial new generating capacity. It also has coincided with ever-increasing U.S. dependence on foreign oil, higher natural gas prices, and uncertainty about future restrictions on the carbon dioxide emissions of coal-fired power plants. To reduce the nation's dependence on crude oil, the Energy Policy Act of 2005 authorizes the Department of Energy (DOE) to diversify the U.S. energy portfolio by, among other things, providing financial incentives to stimulate investment in new nuclear power reactor projects, which can cost more than \$4 billion. The Nuclear Energy Institute, which represents the nuclear power industry, estimates that the industry has spent more than \$2 billion during the past 3 years in preparation for applying to the Nuclear Regulatory Commission (NRC) for licenses to build and operate new reactors.

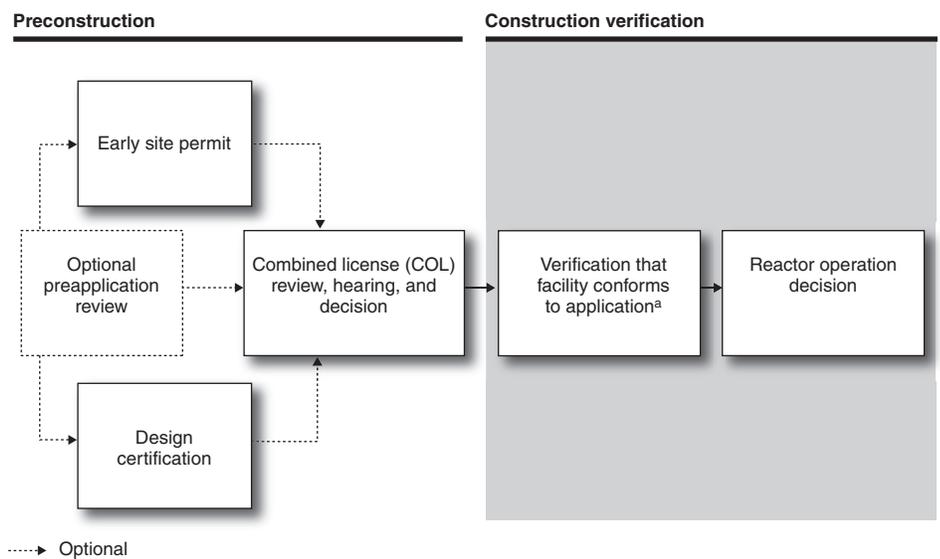
In 1989, NRC promulgated 10 CFR Part 52, which establishes a new combined license (COL) for electric power companies to obtain a license to build and operate a new reactor.<sup>1</sup> The COL is NRC's response to the

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<sup>1</sup>54 *Fed. Reg.* 15386 (Apr. 18, 1989). While NRC has revised its regulatory process, the technical bases for its decisions to make findings have generally remained the same.

nuclear industry's concerns about the length and complexity of NRC's former two-step process of issuing a construction permit followed by an operating license. The COL process provides a one-step approval process that authorizes a licensee to construct and conditionally operate a nuclear power plant; as such, it is intended to provide predictability and early resolution of issues in the review process. In addition, as shown in figure 1, NRC established (1) the design certification, which standardizes the design of a given reactor for all power companies using it, with modifications limited to site-specific needs, and (2) an early site permit, which allows a potential applicant to resolve many preliminary siting issues before filing a COL application. NRC also plans to issue new regulations addressing the construction activities companies can conduct with NRC authorization and oversight (through a limited work authorization).<sup>2</sup>

**Figure 1: The New Reactor Licensing Process under Part 52**



Source: NRC.

<sup>a</sup>NRC's Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) process is designed to verify that a new nuclear facility has been constructed and will operate in conformance with the COL, NRC regulations, and the Atomic Energy Act.

<sup>2</sup>Such activities as site clearing, excavation, road building, transmission line routing, and erecting construction-related support buildings or service facilities do not require NRC authorization.

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As of September 2007, electric power companies had informed NRC of their intent to submit 20 COL applications between October 2007 and about April 2009—5 by December 2007 alone. As shown in figure 2, these companies plan to use five reactor designs: General Electric’s Advanced Boiling Water Reactor (ABWR) and Economic Simplified Boiling Water Reactor (ESBWR), Westinghouse’s Advanced Passive 1000 (AP1000), AREVA’s Evolutionary Pressurized Water Reactor (U.S. EPR), and Mitsubishi Heavy Industries’ Advanced Pressurized Water Reactor (U.S. APWR).<sup>3</sup> NRC has certified two designs that the companies plan to use—ABWR in 1997 and AP1000 in 2006—and is currently reviewing the ESBWR design.<sup>4</sup> The U.S. EPR and U.S. APWR designs have not yet been submitted to NRC for review, although at least one reactor using each design is under construction in another country. Design applications may total up to 15,000 pages, and reference to the certified design will represent a large part of a COL application.

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<sup>3</sup>This report focuses on NRC’s readiness to license new light water reactor designs. It does not address NRC’s readiness to license new advanced reactor designs, such as liquid metal-cooled reactors and high-temperature gas-cooled reactors because they are significantly different from light water reactors.

<sup>4</sup>NRC also certified the Combustion Engineering/Westinghouse System 80+ in 1997 and Westinghouse’s Advanced Passive 600 in 1999.



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Note: Excludes any limited work authorizations companies plan to file allowing them to begin certain construction activities before receiving a license. Information as of September 10, 2007.

Under the COL process, NRC estimates that the first few applications will require about 100,000 hours of staff review and identified around 2,500 associated NRC review activities related to each application's detailed safety, environmental, operational, security, and financial information, which may total several thousand pages. NRC anticipates that for each application, the review process will take 42 months—including 30 months for its staff review, followed by approximately 12 months for a public hearing.<sup>5</sup> In June 2007, NRC approved several actions to improve the use of its resources and further streamline and increase the predictability of its review process. These actions may decrease the overall duration of a given review, depending on how they are implemented.

Since the enactment of the Energy Policy Act of 2005, NRC has accelerated its efforts to build up its new reactor workforce and develop the necessary processes for licensing new reactors. NRC projects that its total workforce size needs to grow from about 3,100 employees to about 4,000 employees by 2010. NRC created the Office of New Reactors (NRO) in October 2006 to lead the new reactor reviews and anticipates that it will employ about 500 people and spend several million dollars a month for contractor support to conduct these reviews in 2008. In January 2007, we reported that NRC had been generally effective in recruiting, developing, and retaining a critically skilled workforce and had taken several actions to enhance its overall workforce capacity; however, we identified several challenges that will require a considerable level of flexibility, staff commitment, and successful strategic human capital management for NRC to be able to appropriately adapt to shifting human capital needs.<sup>6</sup> Accordingly, we recommended that NRC take actions to further address its current and future needs for a critically skilled workforce, and NRC agreed with our recommendations.

In this context, you asked us to review NRC's readiness to evaluate applications for new reactor licenses. Specifically, we examined the steps

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<sup>5</sup>The evidentiary hearing portion of the adjudicative process occurs near the end of the licensing process. However, prehearing activities, which include decisions on standing, contention admissibility, and procedural motions, begin when NRC docket the application and continue during the staff's review.

<sup>6</sup>GAO, *Human Capital: Retirements and Anticipated New Reactor Applications Will Challenge NRC's Workforce*, [GAO-07-105](#) (Washington, D.C.: Jan. 17, 2007).

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NRC has taken to (1) prepare its workforce to review new reactor license applications and to manage its workload and (2) develop its regulatory framework and key review processes for new reactor activities.

To address these questions, among other things, we reviewed NRC documents for new reactor workforce staffing and training, examined NRC's regulations and guidance for its review of license applications, observed internal NRC management meetings, and interviewed NRC managers in NRO and the Offices of Nuclear Security and Incident Response, Nuclear Regulatory Research, and General Counsel. We also obtained the perspectives of the Advisory Committee on Reactor Safeguards, a statutory body of scientists and engineers, and the Atomic Safety and Licensing Board Panel. In addition, we held discussions with nearly all of the announced COL applicants to obtain their views on the efficiency and usefulness of the COL process and its implementation. Finally, we observed several of NRC's public meetings on the new reactor licensing process. We conducted our work from January 2007 through September 2007 in accordance with generally accepted government auditing standards. A fuller discussion of our scope and methodology is presented at the end of our report.

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## Results in Brief

NRC has implemented many actions to prepare its workforce for new reactor licensing reviews and manage its workload, but several key elements of its preparations are still under way. Specifically, NRC has increased its funding for new reactor activities, reorganized several offices, created NRO, and hired a significant number of entry-level and midlevel professionals. To assist its staff in reviewing the safety and environmental portions of the applications, NRC plans to contract out about \$60 million in fiscal year 2008 through support agreements with several DOE national laboratories and contracts with commercial companies. NRC also has rolled out several new training courses and developed some computer-based tools to assist staff in reviewing multiple applications. To enhance its management and coordination of the anticipated work required to review COL applications and design certifications, NRC is using a project management approach to plan and schedule its workload. NRC has made progress in these areas, but several elements of NRC's activities to prepare its workforce are still under way, as the following illustrates:

- As of August 2007, NRC had assigned about 350 staff to NRO, about 10 percent of its workforce. However, some critical positions are vacant, and the office plans to grow to about 500 employees in 2008. NRC also

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is still developing content for in-depth training on reactor designs and providing training in other areas needed for reviewing new reactor applications, and has not yet implemented certain key computer-based tools to provide staff with easy access to commonly used information.

- NRC has developed plans for allocating resources for a design certification application and an early site permit it is currently reviewing, 20 COL applications, 2 additional design certification applications, and a design certification amendment application—all of which NRC expects to have in its review process over the next 18 months. However, NRC has not yet developed specific criteria to prioritize the review of these applications if it needs to decide which applications take precedence. Without criteria, NRC managers are likely to find it more difficult to decide how to allocate resources across several high-priority areas.
- NRC has developed a comprehensive project management approach that includes guidance, a management tracking system, and a contracting support strategy to prepare for COL application reviews. However, it has not yet fully developed criteria for allocating staff and resources to both licensing activities and implementing computer-based tools intended to improve the staff's productivity. Consequently, NRC may have to choose between allocating resources to licensing activities or to further developing these tools.
- NRO established a cross-divisional resource management board early in 2007 for resolving resource allocation issues if major review milestones are at risk of not being met. However, it has not clearly defined the board's role, if any, in managing and setting priorities for resource allocation. As a result, NRO may not be able to efficiently manage the multiple activities associated with reviewing at least 26 applications associated with its new reactor program. NRC managers we spoke with recognize this problem and plan to address it.

NRC has significantly revised its regulatory framework and review process to prepare for licensing new reactors. Specifically, NRC has revised and augmented its rules, guidance, and oversight criteria for licensing and constructing new reactors primarily to provide for early resolution of issues, standardization, and predictability in the licensing process. In making these changes, NRC has regularly interacted with nuclear industry stakeholders to determine which parts of an application's technical and operational content could be standardized and to clarify guidance on certain technical matters. While NRC has made progress in these areas, it

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has not yet completed several actions to implement its review process. For instance, NRC has only recently initiated modifications to its acceptance review process to include both an evaluation of the application's completeness and its technical sufficiency. NRC plans to publish additional acceptance review guidance reflecting these modifications by the end of September 2007. Until this guidance is publicly available, it is unclear whether applicants will need to submit additional information or revise their applications. In addition, NRC is refining its processes to track its requests for additional information to each applicant. In some instances, applicants using the same reference reactor design may be asked the same question, and one applicant may have already provided a satisfactory answer. With a completed tracking process, the second reviewer could access the previously submitted information to avoid duplication.

We are recommending that NRC take four actions—three to better manage its new reactor application workload and one to better ensure that its processes more efficiently and effectively facilitate these reviews. NRC agreed with our recommendations.

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## Background

The Energy Reorganization Act of 1974 established NRC as an independent agency, headed by a five-member Commission, to regulate the nation's civilian use—commercial, industrial, academic, and medical—of nuclear energy and materials, including nuclear power reactors and research and test reactors. NRC's mission is to ensure that civilian users of nuclear materials adequately (1) protect public health and safety; (2) promote the common defense and security, including securing special nuclear materials against radiological sabotage and theft or diversion; and (3) protect the environment. NRC's budget authority grew from \$626 million for fiscal year 2004 to \$824.9 million in fiscal year 2007, and NRC requested \$916.6 million for fiscal year 2008. By law, NRC is required to recover about 90 percent of its budget authority each fiscal year, less certain specified amounts, through the fees it charges licensees and applicants. NRC staff grew from 3,110 as of September 2004 to 3,536 employees as of August 2007.

NRC's design-centered review approach is central to its streamlined COL review process because it allows multiple applicants to reference a particular design by including common information in their applications. Specifically, NRC reviews standardized application content for a reactor design at one site—known as the reference COL. Companies using the same design can then refer to this reference COL content in their

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applications to decrease NRC's need to conduct the same level of review twice on the same application content. NRC expects that this design-centered review approach will provide the applicant with more certainty about the application process and improve its efficiency in reviewing COL applications without compromising safety.

The design-centered review approach intends to leverage work NRC conducts through its design certification process. During that process, NRC examines any possible limits on operations and safety, resolves any issues that arise, and uses a rule-making process to establish a standardized reactor unit design that is not subject to major modifications during the COL review process. However, if a COL application does not reference a design certification, the applicant will have to submit the required design information in its COL application. Furthermore, NRC staff will review any design variations the applicant makes to the reference COL.

For each application, NRC staff prepare the project's Environmental Impact Statement and review other site-specific factors affecting safety and security because these factors are not standard. Accordingly, 10 CFR Part 52 requires that the COL application provide data and assessments of these factors. Alternatively, an applicant may opt to provide this information by applying for an early site permit, which allows the applicant to evaluate the suitability of a given site without going through the full COL application process. Once NRC issues an early site permit, the applicant can reference the permit in its COL application without resubmitting the site information.

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## **NRC Has Implemented Many Actions to Prepare Its Workforce for New Reactor Licensing Reviews, but Several Key Elements Are Still Under Way**

In preparing for COL application reviews in the time frame since our January 2007 report, NRC has continued its hiring and training efforts and made substantial progress in implementing reviewer and management tools. It also has developed a systematic project management approach—which includes models for planning and scheduling activities and contractor support activities—so that it can apply sufficient resources to several applications simultaneously. However, NRC has not yet fully developed criteria for allocating resources across COL applications, and it has not applied separate decision-making criteria for allocating funding for licensing activities and for support activities, such as developing computer-based review tools.

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## NRC Has Taken Steps to Increase Staffing, Training, and Reviewer Tools to Support Its New Reactor Efforts, but Several Actions Are Not Complete

In response to the electric power industry's growing commitment to building new reactors following the enactment of the Energy Policy Act of 2005, NRC has significantly increased its hiring and funding for its new reactor licensing program. NRC's overall budget requests for new reactor licensing activities increased from nearly \$50 million in fiscal year 2006 to about \$175 million for fiscal year 2008. To understand what resources the agency would need, NRC staff developed estimates for how many full-time equivalent (FTE) positions would be needed to review various applications: about 120 FTEs for a design certification, about 60 FTEs for a reference COL,<sup>7</sup> and about 30 FTEs for a subsequent COL. NRC officials noted that the reference COL staff-time estimate does not include any efficiencies gained through applying the design-centered review approach.

To support its review of new reactor COL applications, NRC initially reorganized the Office of Nuclear Reactor Regulation to create a division solely responsible for new reactor licensing work and substantially increased its size to more than 750 employees by hiring of entry- and midlevel employees. In August 2006, NRC created NRO to better prepare for new reactor licensing while ensuring that the Office of Nuclear Reactor Regulation maintained appropriate focus on the safety of the 104 currently operating reactors, and began phasing staff into NRO, primarily from the Office of Nuclear Reactor Regulation, in October 2006.<sup>8</sup> NRO is expected to grow from 350 employees in August 2007 to about 500 staff during fiscal year 2008.<sup>9</sup> In addition, NRC is increasing staff to five other offices with new reactor responsibilities. FTEs for new reactor activities in these offices will increase from 50 to about 90 FTEs in fiscal year 2008, as hiring continues. For example, for new reactor work, the Office of Nuclear Security and Incident Response plans to have four times as many staff and

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<sup>7</sup>NRC estimates that its review of a reference COL would cost applicants about \$26 million, assuming \$258 per hour for reviewer time. The Nuclear Energy Institute estimates that COL applicants would spend about \$100 million for preparing the application, paying NRC licensing fees, responding to NRC during the review process, and overhead. A reactor designer estimates that preparing a design certification application costs \$200 million.

<sup>8</sup>NRC management balanced grade levels, positions, and preferences in assigning staff to the Office of Nuclear Reactor Regulation or to NRO. The Office of Nuclear Reactor Regulation had about 530 employees as of August 2007. Half of the staff for both offices have been at NRC for 5 years or less.

<sup>9</sup>In August 2007, NRO reorganized its Division of New Reactor Licensing, which is responsible for the overall management of license application review activities. NRO's largest division, it includes more support for organizational effectiveness and productivity, contract management, and project management.

the Office of the General Counsel two times as many staff; the Atomic Safety and Licensing Board Panel plans to hire at least two times as many staff, as well as more panelists committed to new reactor work. The Advisory Committee on Reactor Safeguards and the Office of Nuclear Regulatory Research FTE levels will also slightly increase. Several of these offices also reorganized to assume their new responsibilities. Table 1 identifies the new reactor responsibilities of several NRC offices.

**Table 1: NRC Offices' Responsibilities for New Reactors**

Office	Responsibilities
New Reactors	Lead office responsible for siting, design certification, licensing, and oversight for new nuclear power reactors, including construction inspection.
Nuclear Security and Incident Response	Conducts a security review and consults with the Department of Homeland Security on its security review under a memorandum of understanding and conducts an emergency preparedness review in coordination with the Federal Emergency Management Agency.
Nuclear Regulatory Research	Assists or leads on the development of regulatory guidance. Supports NRO on new reactor design activities, including developing technical expertise, experimental data, numerical simulation analyses tools, and the knowledge bases needed for making reliable and technically sound regulatory decisions.
Atomic Safety and Licensing Board Panel	Comprised of independent judges who hear and address concerns of individuals or entities that are directly affected by any licensing or enforcement action involving a facility that produces or uses nuclear materials. Conducts all licensing and other hearings as directed by the Commission. Makes determinations on the standing and admissibility of contentions to a given COL application during the course of the review process and issues initial decision on whether to issue a COL.
General Counsel	Counsels on the licensing of new nuclear power reactors under 10 CFR Parts 50 and 52, including issuance of initial licenses, early site permits, and COLs and on design certification activities; represents NRC staff in related adjudications and on judicial review; and advises the Commission and NRC staff on promulgating and amending NRC regulations and guidance documents.
Advisory Committee on Reactor Safeguards	Reviews and makes recommendations to the Commission on all new reactor applications to build or operate nuclear power reactors and reviews NRC staff's Safety Evaluation Report. The Committee reports directly to the Commission, which appoints its members, and is independent of the NRC staff.

Source: NRC.

NRC has taken steps to expeditiously staff NRO in part because more than half of the work for a 30-month COL review is conducted in the first year. NRO reached its fiscal year 2007 staffing level by filling its midlevel and higher positions, phasing in existing NRC employees, and hiring new employees. Regarding fiscal year 2007, NRO managers noted that (1) budget constraints had limited hiring until NRC's fiscal year 2007 appropriation was enacted in February 2007 and (2) demanding workloads made it difficult for NRC staff to develop vacancy announcements and

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select and interview candidates. Some critical vacancies remain, and NRO will need to grow by an additional 30 percent to reach its fiscal year 2008 target. NRO managers expressed some concern about whether NRO will have sufficient staff with expertise to fill such critical vacancies as project management, structural engineering, and digital instrumentation and control. Several managers in NRO and other NRC offices also expressed concern about NRC's ability to retain staff in the intermediate and longer term and provide sufficient physical space for them.

Regarding training, NRC has taken several steps to build on its existing curriculum so staff can be prepared to review new reactor license applications. Specifically, for new reactor licensing training, in early 2007 NRO adapted some of the Office of Nuclear Reactor Regulation's training to contain technical and regulatory content for new reactors. NRC also offers basic regulatory and technical overview training across a range of areas. In 2008, NRC plans to launch several new courses that will include both overview and detailed training on new reactor designs. To the extent possible, NRO and other offices are also using on-the-job training opportunities to ensure employees have some exposure to the breadth and depth of new reactor work, including shadowing and mentoring programs.

The in-depth and on-the-job training opportunities made available to staff have been somewhat limited to date. For example, the implementation of some technical training courses was delayed because some reactor design features need further clarification, and NRC's budget was constrained until February 2007, when its fiscal year 2007 appropriation was enacted. It is unclear whether employees working on some new reactor activities will be able to take these courses before their work group's design certification or COL applications arrive. In addition, some NRC staff conducting new reactor licensing work will not have related practical experience because they have not participated in early site permit, design certification, or preapplication activities.

NRC is in the process of putting new tools into place to support reviewers as they conduct their work. These tools are designed to enhance productivity and ensure a more consistent and coordinated application review process by providing easily accessible pointers to key reviewer guidance and other information. Some tools are also intended to provide a means to document and share knowledge and lessons learned. (See table 2.)

**Table 2: Computer-Based Tools to Assist NRO Reviewers**

NRO reviewer tools	Intent	Status
"The Wizard" (SharePoint platform) <sup>a</sup>	Designed to make certain information more readily available to staff to facilitate more effective review. This information includes safety standard review plan sections; regulatory guide content; design center information; and relevant codes and standards. The platform may also be populated with topic-specific and general lessons learned, insights, technical tips, and advice.	The Wizard is available but does not contain full content.
Environmental Assessment Reactor Review Team Home	Makes available environmental review plan sections, regulatory guide content, templates and communication tools, archived public comments, and requests for information through a Web portal to facilitate NRC staff review. As an information access site, it can be used for tracking progress, records management, documenting lessons learned, and communications among staff across multiple work teams.	This Web portal is in place.
Safety Evaluation Report templates, by each reactor design type (SharePoint platform)	Facilitates timely drafting of Safety Evaluation Reports by using draft templates for generic formatting for all safety review sections and to leverage work done during design certification reviews. Design-specific matrixes will also be developed to identify which areas of review remain open and need to be reviewed during the COL application.	Most templates are being completed for staff use between August 2007 and March 2008.
Request for Additional Information (RAI) system (SharePoint platform)	Designed to electronically categorize, track, and communicate NRC's requests for information and applicants' responses to them across both individual and multiple applications. Specifically, the system is intended to support (1) NRC staff in generating, reviewing, and issuing RAIs; (2) licensees in responding to RAIs; and (3) staff and licensees in tracking RAIs.	NRC expects the system will be in place by March 2008.

Source: NRC.

<sup>a</sup>SharePoint is a Microsoft Office server tool designed to facilitate collaboration, provide content management features, implement business processes, and supply access to information essential to organizational goals and processes.

The development or completion of such computer-based tools as the RAI system has been delayed until fiscal year 2008 because NRC management gave higher priority to such activities as developing limited work authorization guidance, publishing a proposed rule for assessing aircraft impact characteristics not included in design basis, and completing licensing work already in process. As a result, staff reviews may not be as timely and consistent until these computer-based tools are available, and NRC may not benefit from intended productivity efficiencies.

**NRC Is Implementing a Project Management Approach for Its New Reactor Licensing Program but Needs to Make Further Enhancements**

As part of its workforce preparation, NRC is using a project management approach to conduct and coordinate COL reviews so it can apply sufficient resources to several applications simultaneously. With this approach, NRC intends to enhance its overall ability to ensure priorities are appropriate, eliminate uneven workload, and allow managers to appropriately assess progress. As table 3 shows, the project management approach includes four components intended to communicate the processes, procedures, and tools to complete new reactor licensing projects. They include (1) a Licensing Program Plan manual, (2) general and application-specific models and templates—whose estimates NRO took several steps to refine in 2007, (3) a Microsoft Project tool, and (4) a contracting support strategy. In addition, from June through September 2007, NRO provided information to staff involved in new reactor activities to familiarize them with this approach.

**Table 3: Key Project Management Components for New Reactor Licensing**

<b>Component</b>	<b>Intent</b>
Licensing Program Plan manual	Provides practices, procedures, and governance tools for the management of safety and environmental reviews. The manual includes definitions of organizational roles and responsibilities; a risk management framework; workflow, reporting, analysis, and controls measures; communication tools within NRO; and training outlines tailored by staff and management responsibilities.
Resource schedules and templates for design certifications, reference COLs, subsequent COLs, and early site permits	Provide NRC’s planning estimates, assumptions, and prebaseline plans for conducting each type of review. Templates consist of work task data, resource data reflecting what type of resource and how much, and time needed to accomplish the work. NRO has developed generic models for each type of application and will develop specific models for each slightly before, or as they receive them. The information is maintained through NRC’s Enterprise Project Management Environment.
Enterprise Project Management Environment, also known as the Microsoft Project tool	Provides intranet access to NRC’s management system tracking schedule information. NRO intends to use the tool during the COL review process to plan and re-plan work, track status against project and schedule baselines, help manage resources, generate reports to track progress, and facilitate communication.
Contracting support strategy	Provides support from (1) a blend of four or five commercial contractors organized by NRC’s design centers and supporting DOE laboratories and (2) the U.S. Army Corps of Engineers for additional environmental support and the U.S. Geological Survey for the seismology review.

Source: NRC.

Because it plans to rely on contractors to perform about one-third of its overall review work, NRC issued a request for proposals, developed a contracting toolkit for staff that includes generic templates to facilitate drafting of statements of work, and took steps to enter into or revise

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interagency agreements with several DOE laboratories.<sup>10</sup> NRC plans to obligate about \$60 million to contractors in fiscal year 2008 to assist reviewers on both the safety and environmental portions of the COL applications. In addition, in fiscal year 2007 NRO used contractors to document its overall project management approach and conduct a program assessment and gap analysis for identifying additional process improvements, among other things.

While NRO managers, COL applicants, and reactor designers are generally optimistic about the overall readiness of NRO's staff to review COL applications, NRC faces the following challenges:

- *Developing decision criteria for addressing competing priorities.* NRC has developed plans for allocating resources for a design certification application and an early site permit it is currently reviewing, 20 COL applications, 2 additional design certification applications, and a design certification amendment application—all of which NRC expects to have in its review process over the next 18 months. However, NRC has not yet ranked initial COL application factors for making resource allocations and schedule decisions if licensing work exceeds NRC's new reactor budget. These factors include the quality and completeness of the application itself, the extent to which the COL application references an early site permit or design certification, evidence of the applicant's financial commitment to build a reactor in the near term, and other factors.<sup>11</sup> In commenting on recommendations in our draft report, NRO officials said that NRC will develop these criteria by the end of 2007.
- *Maximizing the use of the Microsoft Project tool.* In June 2007, NRO began using the Microsoft Project tool to schedule certain internal activities and work related to design certification and early site permit applications already under review. To effectively schedule tasks, the

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<sup>10</sup>During 2007, NRC resolved two identified conflicts of interest with using DOE laboratories to support NRO. NRC managers said they faced these conflicts mainly because relatively few companies and individuals with specialized skills do not have links to a potential applicant or reactor designer. NRC management is considering whether to use two other DOE laboratories with identified conflicts of interest.

<sup>11</sup>Commissioners indicated and NRC staff confirmed that these factors apply when allocating resources during budget execution only and should not be applied in preparing budget requests. These factors include 11 for COL applications, 2 for design certifications, and 3 for early site permits.

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Microsoft Project tool needs several layers of NRC staff to regularly estimate and note their progress on each task. Entering this information into the system is a new practice that officials acknowledged will require some adjustment. Even with this tool, it will be a complex undertaking for staff and managers to regularly update and monitor entries, evaluate them for a range of user needs, and review reports generated to assess progress. While NRC has dedicated scheduling and project management resources to coordinate and direct activities, it is too soon to tell whether they are sufficient. Accordingly, understanding workflow, evaluating reports, and continually assessing resource utilization will take some time to become established practice. Most COL applicants generally supported NRC's use of the Microsoft Project tool and noted that it could promote more accountability for adhering to established schedules than has historically been the case.

- *Managing the increased reliance on contractors.* NRO plans to use contracts to support at least one-third of the COL application review process—for fiscal year 2008, NRO's budget request is about the same for contractor support as it is for staff salaries and benefits.<sup>12</sup> NRC's efforts to implement its contractor support strategy are still under way. For example, NRO staff and managers initially defined particular work they expected contractors to conduct in fiscal year 2008. Specifically, NRO plans to use more than 200 task orders for a broad range of skills under at least 10 umbrella contracts or interagency agreements.<sup>13</sup> Contractors are to support about 50 percent of the site-specific and environmental review work, as they did to review early site permit applications. As of early September 2007, NRO staff had completed most initial statements of technical work to be included in each task order, and NRC had awarded three of four commercial contracts and entered into three of seven interagency agreements planned for fiscal year 2008. NRC plans to have the remaining contracts and agreements in place by the beginning of October 2007.

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<sup>12</sup>According to NRC officials, a contractor's FTE of work costs about double that of an NRC permanent staff's FTE of work. Cumulatively, proposed agreement and contract ceilings from fiscal year 2007 through fiscal year 2012 total more than \$300 million, including nearly \$25 million in support from the U.S. Army Corps of Engineers and the U.S. Geological Survey.

<sup>13</sup>As of early September 2007, NRC had committed about \$7 million in fiscal year 2007 funds for five DOE laboratories to perform preparedness, preapplication, and licensing work and about \$2 million for commercial contractors to perform preparedness activities.

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- *Allocating funding for developing reviewer and management tools.* In fiscal year 2008, NRC will have hundreds of licensing activities under way and other internal activities to support the review of COL applications and certification of reactor designs. Evaluating the importance of completing activities that support the reviews—such as ensuring the smooth operation of the Microsoft Project tool, revising computer-based reviewer tools for enhancing productivity, delivering contractor training, increasing information technology support, or revising remaining guidance—may not be as important as completing priority licensing priorities. However, NRC has not developed criteria to determine how it will allocate resources between licensing activities and developing reviewer and management tools.
  - *Clarifying the Resource Management Board's role.*<sup>14</sup> In May 2007, NRO's management team formed a board of deputy division directors that meets weekly. The board is responsible for developing decision-making processes if certain milestones are in danger of not being met, and NRO therefore has to significantly shift resources. While NRO expects the board to recommend actions to mitigate the impact on overall scheduling if such changes are required, it is unclear whether the board will have any role in generally setting priorities and directing resource allocation. Without such clarification, NRO may miss opportunities for more effectively managing multiple activities associated with reviewing as many as 20 applications, certifying designs, granting early site permits, and reviewing applications for limited work authorizations. NRC managers recognize this problem and plan to address it.

According to NRO officials, some efforts are still under way and the effectiveness of others cannot be determined until the application review begins. Consequently, NRO plans to periodically assess the project management approach's effectiveness.

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<sup>14</sup>In July 2007, NRO renamed the Change Management Board to the Resource Management Board.

## NRC Has Significantly Revised Its Overall Regulatory Framework and Review Process, but Several Activities Are Still in Progress

In redesigning its regulatory framework to better resolve issues early and promote standardization and predictability in the licensing process, NRC reached out to stakeholders, particularly those who would be seeking certification for designs or applying for licenses. Industry stakeholders generally consider NRC's design-centered review approach and revised framework to be an improvement over NRC's prior process. However, NRC has not explained to applicants how it plans to implement its revised processes for accepting (docketing) a COL application, requesting additional information, or conducting hearings. These uncertainties may limit expected efficiencies and predictability regarding the total time a COL applicant needs to obtain a license.

## NRC Has Revised Most Key Regulations and Guidance with Considerable Involvement of Stakeholders

During the past 4 years, NRC has taken several steps to significantly revise and augment its primary regulatory framework to prepare for licensing and construction of new reactors. This framework consists of NRC's 10 CFR Part 52 rule; guidance to aid licensees in developing COL application content, such as the Regulatory Guide 1.206; safety and environmental standard review plans that guide reviewers in evaluating applications; and criteria to guide inspectors examining operational programs and construction activities. The framework also includes ancillary rules and guidance related to security, limited work authorization, and fitness for duty. (See table 4 and app. I for more information about the framework's major components and remaining work.)

**Table 4: Major Components of NRC's New Reactor Licensing Regulatory Framework**

Framework component and purpose	Status		Work remaining
	Complete	Incomplete	
<i>10 CFR Part 52 rule making</i> governs the issuance of standard design certifications, early site permits, and COLs for nuclear power plants.	✓		NRC's final rule was published in the <i>Federal Register</i> in August 2007, with an effective date of September 27, 2007. <sup>a</sup>
<i>Regulatory Guide 1.206</i> provides guidance to applicants on how to comply with requirements laid out in 10 CFR Part 52 when submitting applications.	✓		
<i>High-priority regulatory guide updates</i> provide guidance to applicants on implementing specific parts of NRC's new reactor licensing regulations.	✓		
<i>Safety Standard Review Plan</i> provides guidance for NRC staff to conduct safety reviews for nuclear power plants.	✓		

Framework component and purpose	Status		Work remaining
	Complete	Incomplete	
<i>Environmental Standard Review Plan</i> provides guidance for NRC staff to conduct environmental reviews of nuclear power plants.		✓	NRC is awaiting public comments through September 2007 and has not yet determined when the revision of the guidance will be completed.
<i>Limited Work Authorization rule making</i> allows holders of early site permits and COL applicants to conduct certain preconstruction activities without a COL.		✓	NRC approved the rule in April 2007 and issued additional requirements for staff to complete.
<i>Construction Inspection Program (CIP)</i> is a series of inspections aimed at validating the acceptability of the construction programs, processes, and products for new nuclear facilities.		✓	CIP framework is largely in place; NRC plans to increase CIP staff as needed through 2014. In June 2007, NRC announced plans to enhance its Vendor Inspection Program.
<i>Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)</i> enable NRC to determine whether a new nuclear facility has been constructed and will operate in conformance with the COL, NRC regulations, and the Atomic Energy Act.		✓	Once a COL is issued, the licensee builds the reactor facility and documents completion of the ITAAC. Before the facility can begin operations, NRC must verify that all ITAAC have been met. To support this determination, the NRC is developing the closeout verification process that will work in coordination with its CIP. NRC plans to issue draft guidance about this process by the end of 2008.
<i>Physical Protection rule making</i> governs security requirements for physical protection of nuclear power plants.		✓	NRC plans to issue the draft final rule in 2008.
<i>Aircraft Impact Assessment rule making</i> will amend Part 52 by establishing assessment requirements for security measures that reactor designers incorporate early in the design process.		✓	NRC has shared information with reactor and plant designers and plans to issue a proposed rule for public comment in September 2007 or later.
<i>Fitness for Duty rule making</i> governs drug and alcohol testing programs and establishes requirements for managing worker fatigue at operating nuclear power plants.		✓	In July 2007, NRC modified its April 2007 final rule; NRC expects to issue a final rule in early 2008. The Commission directed staff to engage industry and other stakeholders to complete associated regulatory guidance.

Source: NRC.

<sup>a</sup>72 Fed. Reg. 49351 (Aug. 28, 2007).

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In revising and augmenting this regulatory framework, NRC took steps to convey key changes and solicit feedback through public meetings and formal interactions with stakeholders to help resolve issues early.<sup>15</sup> NRC also solicited information from potential applicants for planning purposes. In addition, NRC frequently reached out to applicants and reactor designers during 2006 and 2007 regarding new reactor licensing by

- supporting the formation and activities of design-centered working groups for COL applicants and design certification applicants to help standardize COL application content and format and clarify NRC's expectations for the level of detail in COL applications;<sup>16</sup> and
- holding several public meetings related to specific technical areas—such as digital instrumentation and control, probabilistic risk assessment, and seismic analyses—and operational program areas, including quality assurance, reactor component manufacturer inspections, training, and emergency planning.

NRC accelerated some schedules to have key components of the regulatory framework in place before applications are submitted. Both applicants and NRC acknowledge that the accelerated, overlapping time frames for power companies to prepare their COL applications while NRC revises its regulatory framework have neither been ideal nor fully avoidable. Specifically, NRC did not promulgate its Part 52 rule until August 28, 2007, 4 months after originally planned. NRC is still in the process of completing some rules and guidance related to both licensing and construction activities. Applicants expressed some concern that NRC's review of applications, in some areas, could change as long as these components remain incomplete. For example, in September 2006, NRC proposed a rule to update physical protection requirements, which officials told us is not due out in final form until 2008. In addition, its limited work authorization rule, while substantially complete, will not be

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<sup>15</sup>Participants at the public meetings of the design-centered working group we observed primarily represented NRC, COL applicants, reactor designers, or the Nuclear Energy Institute. Similarly, public comments on the proposed rule for Part 52 were mainly provided by industry stakeholders. The Department of Homeland Security and the Environmental Protection Agency also commented.

<sup>16</sup>NuStart and UniStar—two nuclear energy consortia composed of electric power companies and reactor design companies—have supported the design-centered working group's standardization efforts.

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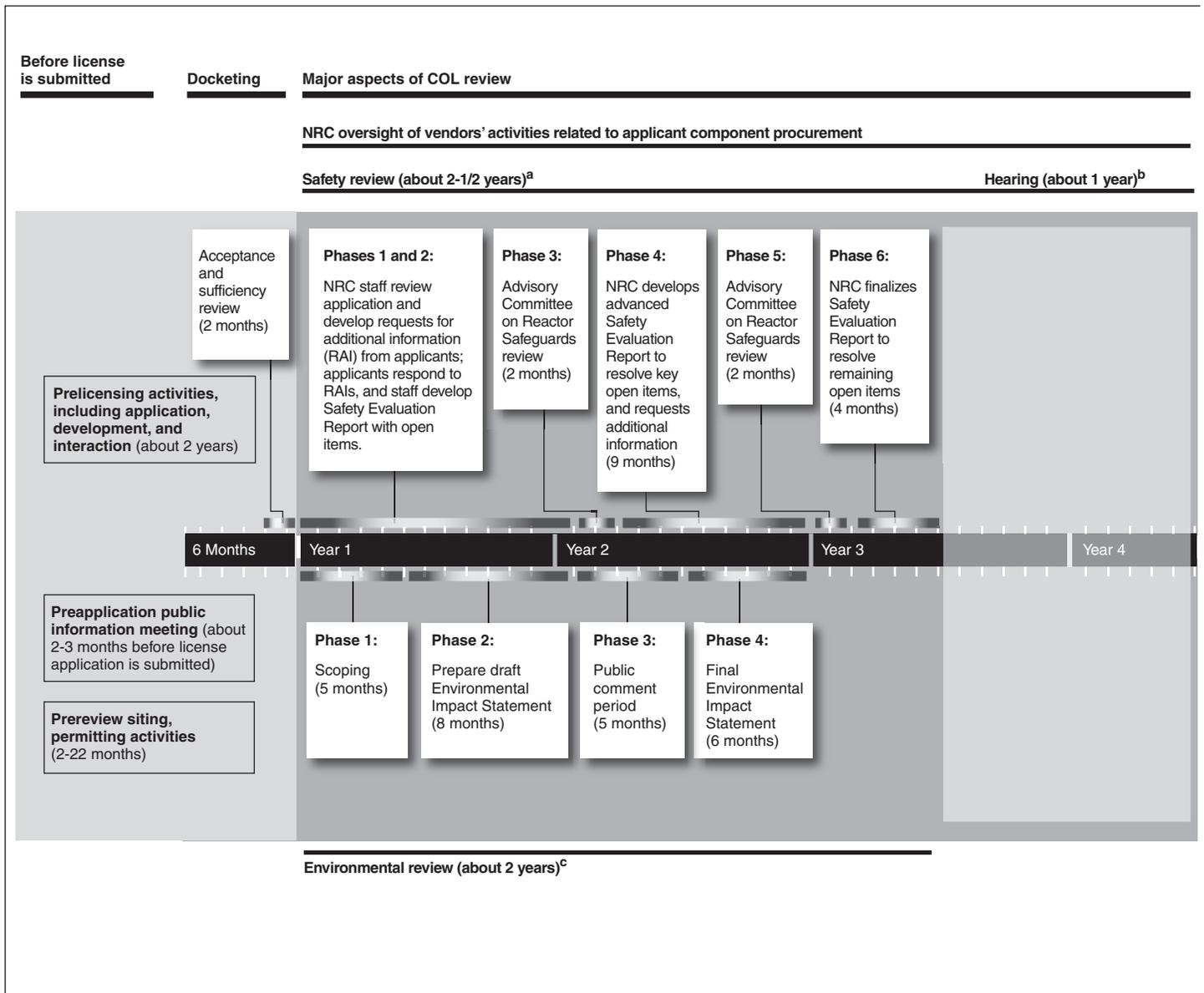
available in final form before October 2007, and NRC is in the process of developing associated guidance. NRC has not yet told applicants how it will apply resources to limited work authorization applications or how this will affect individual COL application review schedules. Also, because NRC only recently solicited public comments to further update its environmental guidance, applicants may have more difficulty developing specific COL content for unresolved issues. Furthermore, NRC is continuing to develop several components of the Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) process, such as the final closeout review for ensuring all criteria are met. Finally, NRC has just begun its multiyear process of staffing its Construction Inspection Program; efforts to date have primarily included conducting a range of quality assurance inspections activities.

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**While NRC Has Taken Steps to Advance the Design-centered Review Approach, Some Aspects of the Implementation Process Are Not Yet Complete**

NRC and applicants have taken steps to advance how the design-centered review approach will be implemented during 2008 and 2009 to facilitate NRC's review of applications for at least 20 COLs, 3 design certifications, 1 design certification amendment, and 1 early site permit, as well as 1 or more limited work authorizations. Figure 3 presents a simplified diagram of the COL application review process, including estimated time frames associated with each aspect of the review; major preapplication activities and postlicensing activities associated with the completion and verification of ITAAC after the Commission grants the COL; and information about the construction time period should an applicant choose to build a plant.

**Figure 3: Major Aspects of the COL Review Process**



COL  
granted

After COL is granted

Commission  
finding that  
ITAAC has  
been met

Fuel  
load

Operation

NRC Construction Inspection Program inspectors sample construction activities to support ITAAC completion

Construction (4-5 years)



COL  
issued  
with ITAAC



Indicates a milestone activity, not a process.

Sources: NRC and Art Explosion (photographs).

<sup>a</sup>Only the COL application safety review process is illustrated here. Early site permit, design certification, and limited work authorization activities also may affect timelines and the scope of some activities.

<sup>b</sup>NRC currently is considering internally recommended changes to its hearing process.

<sup>c</sup>Some draft Environmental Impact Statement activities also occur in phase 1.

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NRC officials expect to develop schedule estimates for each application after it is received, conduct an estimated 60-day initial review of technical sufficiency and completeness as a basis for docketing an application; and if the application is found acceptable, develop an estimated schedule for completing the review. The COL review process includes three primary areas of review: the safety/technical review, which results in a Safety Evaluation Report; the environmental review, which results in an Environmental Impact Statement; and the adjudicatory review, which results in hearing findings/orders.

Throughout the safety and environmental reviews, NRC typically develops several hundred requests for additional information that range in length and complexity to ascertain the sufficiency of the information the applicant has provided so that NRC can develop its findings. NRC officials estimated that the safety review will take 30 months, the environmental review 24 months. Prehearing activities take place concurrently with the staff's reviews, while the hearing on any contested issues and on the uncontested portion of the application takes about 12 months once NRC staff have completed their safety and environmental review documents.

COL applicants and reactor designers told us they support NRC's design-centered review approach. They expect that standard applications will enable NRC staff, to the maximum extent practical, to use a "one issue, one review, one position" strategy. They said this approach is feasible if applicants and NRC staff implement it as intended, in accordance with guidance set out in NRC's Regulatory Guide 1.206 and Standard Review Plan. Most applicants and managers stated that they plan to be thorough, timely, and disciplined in implementing the process for reviewing COL applications. However, they also expected that some processes and procedures will be clarified during the implementation process. Furthermore, several COL and design applicants jointly developed detailed matrixes to identify all reference COL application parts that are identical to the design and all subsequent COL application parts that are identical to the reference COL. These parts are incorporated by reference, other parts are clearly identified as including some similar content, and the remaining parts are clearly identified as site specific. Also, the Nuclear Energy Institute and applicants developed standard templates for certain parts of

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the application content—for example, some operational programs—and NRC agreed to their use.<sup>17</sup>

While NRC has substantially defined its COL review process, it is not yet clear how the agency will implement a few key components. For example, NRC is revising the acceptance review process and the conduct of hearings in response to an internal task force's recommendations. Consequently, uncertainties remain about how these processes will be implemented, which may make it more difficult for applicants to know what information they must provide and how NRC will review their applications:

- *Clarifying recent acceptance review process changes.* In June 2007, 3 months before it expected to receive the first COL applications, NRC announced it would expand its acceptance review process to include not only an evaluation of the application's completeness but also its technical sufficiency. NRC also increased the allotted amount of time for this review from 30 to 60 days. The intent of the new process is to enable NRC to identify areas of potential concern early in the process and discuss them with the applicant. NRC expects that applicants will submit high-quality, complete applications for docketing. By the end of September 2007, NRC plans to publicly release associated internal guidance that its staff will use for deciding whether to accept, delay, or reject docketing.<sup>18</sup>
- *Better managing the request for additional information process.* Such requests to assess technical sufficiency during the review process have been a central component of prior safety and environmental reviews, yet a few steps remain to better ensure efficiency. NRC is still developing its process for tracking requests for additional information from applicants. However, NRC cannot yet coordinate these requests to multiple applicants who are using the same reactor design, which may lead to unnecessary duplication of effort. For example, in some instances, applicants using the same reference reactor design may be asked the same question, and one applicant may have already provided a satisfactory answer. If NRC's

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<sup>17</sup>While most COL applicants said that 65 percent to 80 percent of their application's content will be standardized, this percentage does not equate to the amount of time or resources NRC will need to review the application. According to the applicants, the 20 percent of content that is not standardized represents site-specific safety and environmental analyses that require far more than 20 percent of both COL applicants' and NRC's time and resources to complete.

<sup>18</sup>NRC officials told us that the acceptance review assessment also will inform how it develops the review schedule for each application.

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tracking system were in place, the second reviewer could have access to the previously submitted information, thereby avoiding another request for information and improving the efficiency of the review. Several COL applicants also expressed concern that duplicative or unnecessarily detailed requests for information may result because many of the reviews will be conducted simultaneously by multiple reviewers. Until the revised process is available to staff and communicated to stakeholders, it is unclear whether NRC will gain intended efficiencies in applying the design-centered review approach to its request for information process.

- *Addressing ITAAC process implementation concerns early.* Some NRC staff and COL applicants said they would benefit from further discussion about how NRC will (1) oversee the applicant's implementation of ITAAC for the construction and operation of the new nuclear reactor units and (2) determine that an ITAAC is complete. In addition, applicants will need to inform NRC about certain procurement and construction activities, such as the acquisition of major parts.
- *Completing revisions to the hearing process.* NRC is revising its policy for conducting hearings on both the contested and uncontested portions of applications.
  - In June 2007, NRC issued a proposed policy statement that would allow the Atomic Safety and Licensing Board Panel to consolidate hearings on contentions related to the standardized portions of multiple applications.
  - The process for hearings for the uncontested portion of the COL proceeding may change. The Commission plans to seek legislative authority from the Congress to eliminate the statutory requirement to conduct a hearing even if no one has requested it in order to conserve resources. If a hearing must be held, however, the Commission has taken steps to assume responsibility for conducting the uncontested portion of hearings. Currently, the Atomic Safety and Licensing Board Panel is responsible for conducting all of NRC's hearings, not just those associated with new reactor applications. NRC assumes that it would save considerable staff and Panel resources if the Commission takes the responsibility for this portion of the hearings because it could conduct a different style of hearing.

Beyond the changing processes and unresolved technical issues that remain—such as evaluating applicants' use of digital instrumentation and controls, NRC faces some general constraints because of the short or overlapping time frames between the preparation of its regulatory

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framework and process and the submission of applications starting in October 2007. For instance, for the environmental component of NRC's review, NRC would prefer to have about 22 months of preapplication discussions with the applicants to allow staff to plan its work more effectively and identify potential areas of concern. However, these discussions are at the applicant's discretion; none of the fiscal year 2008 applications will begin with this lead time, and some may have had as little as 2 months. Also, while NRC has scheduled considerable resources to conduct design certification reviews concurrently with its COL reviews, applicants have announced plans to use two new reactor designs that have not been submitted to NRC for certification, a reactor designer is amending its previously certified design, and another designer may also revise its design. These additional changes likely will tax NRC's resources and stafftime.

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## Conclusions

NRC has made major strides in developing its new licensing process for nuclear reactors to improve timeliness and provide more predictability and consistency during reviews. Nevertheless, NRC will face a daunting task in implementing this new process while at the same time facing a surge in applications over the next 18 months.

We recognize that NRC cannot prepare for all contingencies in its review of license applications under this new process, but we also find that NRC could be better positioned to manage the process if it further refined the criteria and processes it has already put into place. First, while NRC has identified factors for staff to consider in developing the fiscal year 2008 budget proposal for new reactor activities, it has not made plans to use these factors in making resource allocations and schedule decisions. As a result, NRC may find it difficult to set priorities as it begins to review applications early next year. Second, NRC has not implemented some reviewer and management support tools that are intended to facilitate efficiency and productivity, and may not devote sufficient resources to their completion in the future. Third, NRO established the Resource Management Board to recommend actions when the office is at risk of missing major milestones. However, NRO has not specified the extent to which the board is responsible for generally setting priorities or allocating resources, which is likely to be much more challenging once applications are submitted. NRC managers plan to clarify the board's responsibilities. Finally, the design-centered approach is premised, in part, on streamlining the review process through standardization. However, NRC has not worked out a process for coordinating multiple, similar requests for additional information, which could facilitate greater efficiencies.

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## Recommendations for Executive Action

To better ensure that its workforce is prepared to review new reactor applications and its review processes more efficiently and effectively facilitate reviews, we recommend that NRC take the following four actions:

- Fully develop and implement criteria for setting priorities to allocate resources across applications by January 2008.
- Provide the resources for implementing reviewer and management tools needed to ensure that the most important tools will be available as soon as is practicable, but no later than March 2008.
- Clarify the responsibilities of NRO's Resource Management Board in facilitating the coordination and communication of resource allocation decisions.
- Enhance the process for requesting additional information by (1) providing more specific guidance to staff on the development and resolution of requests for additional information within and across design centers and (2) explaining forthcoming workflow and electronic process revisions to COL applicants in a timely manner.

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## Agency Comments

We provided NRC with a draft of this report for its review and comment. In written comments, NRC agreed with our recommendations. (See app. II.) In addition, NRC provided comments to improve the report's technical accuracy, which we have incorporated as appropriate.

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## Scope and Methodology

To examine the steps NRC has taken to prepare its workforce to review new reactor license applications and manage its workload, we obtained information about its workforce preparation by reviewing NRC documents, conducting semi-structured interviews with several managers directly responsible for the planning and implementation of new reactor licensing activities, and observing internal NRC meetings. More specifically, we reviewed strategy and commission papers, licensing program planning documents and briefings, and a range of documents regarding reorganization, staffing, training, hiring, contracting, and project scheduling. We supplemented this information through interviews with NRC managers in NRO; the offices of Nuclear Security and Incident Response, Nuclear Regulatory Research, General Counsel, and Human Resources; the Advisory Committee on Reactor Safeguards; and the Atomic Safety and Licensing Board Panel. We also observed several NRO-

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specific internal management meetings and employee training sessions, and NRO staff demonstrated their Microsoft Project tool and associated scheduling models and templates. We updated NRC workforce data presented in our January 2007 report entitled *Human Capital: Retirements and Anticipated New Reactor Applications Will Challenge NRC's Workforce*. We also obtained budget data from NRC's Office of the Chief Financial Officer and determined that these data were sufficiently reliable for the purposes of this report.

To examine the steps NRC has taken to develop its regulatory framework and key processes, we reviewed various NRC reports, meeting transcripts and minutes, and strategy and commission papers and supplemented this information with interviews with cognizant NRC managers. We conducted semi-structured interviews with representatives from 2 nuclear power consortia and 16 of the 17 electric power companies that have announced plans to file a COL application, as well as 2 reactor design companies. We also interviewed officials of the Nuclear Energy Institute; the Union of Concerned Scientists; the Institute of Nuclear Power Operations; Winston and Strawn, LLP; and the Georgia Public Service Commission. In addition, we observed several of NRC's design-centered working group and public meetings focused on new reactor licensing activities, and attended conferences held on new reactor licensing.

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As agreed with your offices, unless you publicly announce the contents of this report, we plan no further distribution until 30 days from the report date. At that time, we will send copies to appropriate congressional committees, the Chairman of NRC, the Director of the Office of Management and Budget, and other interested parties. We will also make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

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If you or your staffs have any questions about this report, please contact me at (202) 512-3841 or [gaffiganm@gao.gov](mailto:gaffiganm@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix III.



Mark E. Gaffigan  
Acting Director, Natural Resources  
and Environment

# Appendix I: Major Components of NRC's New Reactor Licensing Framework

Framework component	Key NRC actions/status
<p><b>10 CFR Part 52 rule making:</b> Governs the issuance of standard design certifications, early site permits, and combined licenses (COL) for nuclear power plants. The final rule amends or makes conforming changes to 10 CFR Parts 1, 2, 10, 19, 20, 21, 25, 26, 50, 51, 52, 54, 55, 72, 73, 75, 95, 140, 170, and 171.</p>	<ul style="list-style-type: none"> <li>• In April 1989, NRC promulgated 10 CFR Part 52 to reform its licensing process for new nuclear power plants.</li> <li>• In December 1998, NRC issued SECY-98-282, "Part 52 Rulemaking Plan," to update 10 CFR Part 52 based on its experience in using the standard design certification process.</li> <li>• In March 2006, NRC published a revised proposed rule to update Part 52 for public comment.</li> <li>• In October 2006, NRC staff forwarded draft final rule to the Commission for consideration.</li> <li>• In April 2007, the Commission made the rule final, pending certain revisions.</li> <li>• On May 22, 2007, NRC posted the draft final rule on its Web site while the Office of Management and Budget completed its review.</li> <li>• On August 28, 2007, the final rule was published in the <i>Federal Register</i>.</li> </ul>
<p><b>Development of Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants":</b> Describes and makes available to the public (1) data that NRC staff need in reviewing applications for permits and licenses, (2) methods that NRC staff consider acceptable for use in implementing specific parts of the agency's regulations, and (3) techniques that NRC staff use in evaluating specific problems or postulated accidents.</p>	<ul style="list-style-type: none"> <li>• In September 2006, NRC staff posted Draft Guide 1145, the precursor to Regulatory Guide 1.206, on its Web site for public comment.</li> <li>• In April 2007, NRC posted completed sections of Regulatory Guide 1.206 for preliminary use.</li> <li>• In June 2007, NRC issued final guide in total.</li> </ul>
<p><b>Update of high-priority regulatory guides:</b> Provides guidance to applicants on implementing specific parts of the regulations, techniques used by the NRC staff in evaluating specific problems or postulated accidents, and data the staff will need to review permit or license applications.</p>	<ul style="list-style-type: none"> <li>• In July 2006, NRC staff identified about 30 high-priority regulatory guides to update by March 2007.</li> <li>• Public comment period for the high-priority regulatory guides ended in December 2006.</li> <li>• In March 2007, NRC staff completed publishing these guides for new reactor licensing activities.</li> </ul>
<p><b>Update of Safety Standard Review Plan (SRP), "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," NUREG 0800:</b> Provides guidance to NRC staff for evaluating whether an applicant or licensee complies with 10 CFR Parts 50 and 52. SRP's principal purpose is to ensure the quality and uniformity of staff safety reviews.</p>	<ul style="list-style-type: none"> <li>• In August 2004, NRC staff began issuing updates to SRP sections. The staff also made public its reprioritized schedule for updating SRP sections starting in April 2005 to support new reactor licensing.</li> <li>• In January 2006, NRC accelerated the issuance schedule to March 2007.</li> <li>• In March 2007, NRC issued all SRP chapters, except chapter 19 on probabilistic risk assessment.</li> <li>• In June 2007, NRC issued the probabilistic risk assessment chapter.</li> </ul>

**Appendix I: Major Components of NRC's New  
Reactor Licensing Framework**

Framework component	Key NRC actions/status
<p><b>Update of Environmental Standard Review Plan (ESRP), "Standard Review Plans for Environmental Reviews for Nuclear Power Plants," NUREG 1555:</b> Provides guidance to NRC staff for conducting environmental reviews of nuclear power plant license applications.</p>	<ul style="list-style-type: none"> <li>• NRC last updated ESRP in 1999.</li> <li>• In 2006, NRC staff prioritized ESRP sections and began to update them.</li> <li>• Draft Revision 1 revises one or more sections of nearly all chapters.</li> <li>• In August 2007, NRC convened a public meeting to obtain comments on draft revisions and is accepting comments through mid-September 2007.</li> </ul>
<p><b>Limited Work Authorization rule making:</b> Revises (1) the scope of activities for which a construction permit, COL, or limited work authorization is necessary; (2) the scope of construction activities that may be performed under a limited work authorization; and (3) the review and approval process for limited work authorization requests.</p>	<ul style="list-style-type: none"> <li>• In March 2006, NRC published a proposed rule that would substantially amend Part 52, but not Part 50.</li> <li>• In response to public comments, NRC prepared a supplemental proposed rule intended to reduce the time between an applicant's decision to proceed with a COL application and the start of commercial operation.</li> <li>• In October 2006, NRC published the supplemental proposed rule.</li> <li>• In February 2007, NRC staff submitted a draft final rule to the Commission for review.</li> <li>• In April 2007, the Commission approved the rule and issued additional requirements for NRC staff to complete.</li> <li>• The rule was submitted to the Office of Management and Budget for clearance review on August 30, 2007.</li> </ul>
<p><b>Construction Inspection Program (CIP):</b> Has several components and is designed for NRC to develop a level of confidence in the licensee's programmatic controls. CIP will involve a combination of differently directed inspections, all of which are aimed at validating the acceptability of the construction programs, processes, and products. The components include four inspection manual chapters (IMC), periodic assessment, and vendor oversight activities.</p>	<ul style="list-style-type: none"> <li>• In 2001, NRC renewed prior efforts to update the CIP by incorporating lessons learned into the revised framework. The team includes regional and headquarters licensing and inspection staff.</li> <li>• In April 2003, NRC issued IMC-2501, "Early Site Permit."</li> <li>• In June 2005, NRC issued IMC-2502, "Pre-Combined License (Pre-COL) Phase," on quality assurance, engineering, and environmental protection.</li> <li>• In April 2006, NRC issued IMC-2503, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)," for inspecting construction activities and supporting completion of the ITAAC.</li> <li>• In April 2006, NRC issued IMC-2504, "Non-ITAAC Inspections," for inspecting programmatic areas.</li> <li>• In June 2007, NRC published information about how it plans to enhance its Vendor Inspection Program, including developing program guidance and increasing audit and inspection activities.</li> </ul>

**Appendix I: Major Components of NRC's New  
Reactor Licensing Framework**

Framework component	Key NRC actions/status
<p><b>Inspections, Tests, Analyses, and Acceptance Criteria:</b> Specifies that a COL application must identify the inspections, tests, and analyses (including those that apply to emergency planning) that the licensee will perform to provide NRC with data to determine whether the applicant has met NRC's acceptance criteria and the reactor has been constructed and will operate in conformance with the COL, NRC regulations, and the Atomic Energy Act.</p>	<ul style="list-style-type: none"> <li>• In 2001, to update the inspection program, NRC formed the Construction Inspection Team, which includes staff from each region, new reactor licensing, and inspection program management.</li> <li>• In October 2005, NRC staff issued "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria." The Commission then provided policy direction on license conditions for operational programs in a COL application and the use of emergency planning/emergency preparedness ITAAC.</li> <li>• In April 2006, NRC issued IMC-2503, "Inspections, Tests, Analyses, and Acceptance Criteria," and IMC-2504, "Non-ITAAC Inspections," which describe the programs for inspecting construction activities.</li> <li>• In January 2007, NRC solicited stakeholder input from public meetings.</li> <li>• In March 2007, NRC staff presented to the Commission its plan for selecting ITAAC for inspection and closing these ITAAC.</li> <li>• In May 2007, the Commission approved the staff's approach for verifying the closure of licensees' ITAAC through a sample-based inspection program.</li> <li>• In July 2007, the Advisory Committee on Reactor Safeguards concurred with the approach and proposed threshold values.</li> <li>• NRC continues to develop inspection procedures; work processes and procedures to support the closure of ITAAC and the implementation of the enforcement process; and a methodology for assessing licensee performance. NRC plans to prioritize activities to ensure that products will be ready to support inspector training and inspections.</li> </ul>
<p><b>10 CFR Part 73 rule making on physical protection:</b> Governs requirements for physical protection of nuclear power plants. The rule is intended to codify orders issued in response to September 11, 2001, and fulfill certain provisions in the Energy Policy Act of 2005 by (1) enhancing requirements for access controls, event reporting, security personnel training, safety and security activity coordination, contingency planning and radiological sabotage protection and (2) adding requirements related to background checks for firearms users and authorization for enhanced weapons.</p>	<ul style="list-style-type: none"> <li>• In October 2006, NRC published a proposed rule to codify several physical protection orders into sections 73.55 and 73.56. The public comment period closed in March 2007.</li> <li>• Since July 2007, NRC has held public meetings on draft guidance related to this rule making, and has provided specific sections of the draft guidance to further inform stakeholders and the public.</li> <li>• NRC expects to post the draft final rule for 10 CFR Part 73 on its Web site in 2008.</li> </ul>
<p><b>Aircraft Impact Assessment rule making:</b> Requires reactor unit designers to perform a rigorous assessment of design features that could provide additional inherent protection to avoid or mitigate the effects of an aircraft impact while reducing or eliminating the need for operator actions, where practicable.</p>	<ul style="list-style-type: none"> <li>• In April 2007, the Commission directed NRC staff to include aircraft impact assessment requirements in 10 CFR Part 52.</li> <li>• Since April 2007, NRC has discussed plans for assessing aircraft impact characteristics not included in design basis with reactor and plant designers who have submitted applications.</li> <li>• NRC plans to publish a proposed rule for public comment in September 2007 or later.</li> </ul>

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**Appendix I: Major Components of NRC's New  
Reactor Licensing Framework**

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<b>Framework component</b>	<b>Key NRC actions/status</b>
<b>10 CFR Part 26 rule making on fitness for duty:</b> Governs drug and alcohol testing programs and establishes requirements for managing worker fatigue at operating nuclear power plants.	<ul style="list-style-type: none"><li>• In April 2005, NRC staff presented its proposal to amend the fitness for duty rule.</li><li>• In August 2005, NRC published the proposed rule in the <i>Federal Register</i>. The public comment period ended in December 2005.</li><li>• In March 2006, NRC held a public meeting on the public comments to the proposed rule.</li><li>• In October 2006, NRC posted the draft final rule on its Web site.</li><li>• In April 2007, the Commission approved the final rule and directed staff to continue to engage stakeholders in complete associated regulatory guidance.</li><li>• In July 2007, NRC modified the approved rule. NRC expects to issue a final rule in early 2008.</li></ul>

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Source: NRC.

# Appendix II: Comments from the Nuclear Regulatory Commission



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

September 14, 2007

Mr. Mark Gaffigan  
Acting Director, Natural Resources  
and Environment  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, D.C. 20548

Dear Mr. Gaffigan:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your e-mail dated August 29, 2007, requesting NRC review and comment on your proposed report entitled, "Nuclear Energy: NRC's Workforce and Processes for New Reactor Licensing Are Generally in Place, but Uncertainties Remain as Industry Begins to Submit Applications" (GAO-07-1129). I appreciate the time and effort that you and your staff have invested in reviewing this important topic and the care that you have taken to ensure that your report is constructive and accurate.

Overall, the NRC considers the draft report to be comprehensive, fair, and balanced. The report accurately identifies the accomplishments as well as the challenges that the agency faces in preparing its workforce for new reactor licensing reviews. Specifically, the report discusses the NRC's ability to manage its workload associated with the anticipated 20 new reactor applications in the next 18 months. Ultimately, the NRC believes the report's findings, conclusions, and recommendations to be very helpful.

The agency continues to aggressively take steps to address these challenges. The Office of New Reactors (NRO) continues to be proactive in hiring staff with the appropriate skill sets and providing key training to staff members. In addition, NRO continues to develop tools that will enhance consistency and coordination, as well as, increase efficiency in reviewing combined license (COL) applications.

The enclosure provides some minor comments for your consideration. We plan to implement your recommendations. Should you have questions about these comments, please contact Ms. Melinda Malloy at (301) 415-1785.

Sincerely,

A handwritten signature in black ink, appearing to read "Luis A. Reyes".

Luis A. Reyes  
Executive Director  
for Operations

Enclosure:  
NRC's Comments on Draft GAO-07-1129

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# Appendix III: GAO Contact and Staff Acknowledgments

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## GAO Contact

Mark E. Gaffigan, (202) 512-3841 or [gaffiganm@gao.gov](mailto:gaffiganm@gao.gov)

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## Staff Acknowledgments

In addition to the individual named above, Richard Cheston, Assistant Director; Amanda Leissoo; Sarah J. Lynch; Amanda Miller; Omari Norman; Carol Herrnstadt Shulman; Julie E. Silvers; and Elizabeth Wood made key contributions to this report.

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