U.S. Nuclear Regulatory Commission

2011 Data Center Consolidation Plan and Progress Report

Version 2.0

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Enclosure

Contents

1 Introduction

Congress created the U.S. Nuclear Regulatory Commission (NRC) as an independent agency in 1974 to enable the safe use of radioactive materials for beneficial civilian purposes while ensuring the protection of people and the environment. The NRC regulates commercial nuclear power plants and other uses of nuclear materials, such as in nuclear medicine, through licensing, inspection, and enforcement of its requirements.

The NRC strives to strategically apply information technology (IT) to support its mission of protecting people and the environment. Additionally, the agency seeks to modernize technology in cost-effective and efficient ways that meet its business requirements.

At the core of the NRC's IT infrastructure are production data centers that house the agency's enterprise servers (e.g., file, print, e-mail), applications, local area network/wide area network components, and other critical IT assets. The agency's Data Center Consolidation Project is critical to ensuring that the IT resources required by the staff are readily available to meet the NRC's mission and goals.

The NRC's Data Center Consolidation Project is part of an overall IT modernization initiative undertaken in response to a constrained IT budget, aging IT hardware, and outdated legacy application systems. In order to respond to these factors, the agency is currently planning to leverage a combination of strategies to reduce its data center footprint, including energy consumption and operation costs, through the increased use of cloud computing alternatives (both Government and commercial); application system modernization; increased server and desktop virtualization; a planned energy-efficient, consolidated data center; and the application of other green technologies across the enterprise.

This final Data Center Consolidation Plan, developed in response to the Office of Management and Budget (OMB) memorandum on the Federal Data Center Consolidation Initiative (FDCCI), dated February 26, 2010, provides a high-level roadmap for transitioning the agency's data centers to consolidated end-state architecture. While the NRC also houses IT equipment in facilities such as local area network rooms, test facilities, training centers, and disaster recovery sites; the plan does not include these sites but specifically addresses the NRC's production data centers.

In completing this plan, NRC personnel performed a physical inventory of servers and equipment to verify that inventory data and the consolidation plan were complete, accurate, and consistent.

2 Agency Goals for Data Center Consolidation

As outlined in the OMB memorandum, the NRC's Data Center Consolidation Plan focuses on the following core aspects related to data center consolidation:

- reducing the number of data centers
- targeting reductions in costs associated with data center hardware, software, and operations
- increasing the overall security posture of agency IT assets

- shifting agency IT investments to standardize computing platforms for enterprise-wide applications
- exploring technologies such as server and desktop virtualization
- fostering the adoption of common enterprise solutions to maximize the use of available resources
- promoting green IT technologies to reduce the overall energy and real estate footprint of agency data centers
- leveraging cloud computing to the maximum extent possible for workforce productivity and administrative support applications such as financial management, human resources, procurement, messaging, Web conferencing, notification systems, and commodity services

The NRC is identifying areas where it may realize cost savings and energy reduction through a variety of approaches. These approaches include the recent implementation of a commercial off-the-shelf (COTS) data center management solution that provides the ability to monitor and track key data center characteristics, including energy usage, temperature, and humidity.

One of the main goals of consolidation is a significant reduction in energy consumption. During fiscal years (FYs) 2012 through 2015, the NRC will take action to achieve an overall target of 10-percent reduction in energy consumption in its data centers. To achieve this target, the agency is planning for physical data center consolidation and modernization. This effort will include an assessment of current hardware and software assets in the agency's production data centers to identify opportunities for consolidating systems, modernizing application systems, using virtualization, and the installation of a COTS solution to monitor power and environmental conditions. As data center consolidation progresses, the NRC will analyze the potential to achieve additional reductions in energy consumption through the use of modern, energy efficient technologies for data center cooling and through the exploration of IT hardware upgrades that significantly reduce energy consumption and heat output.

3 Implementing Shared Services/Multitenancy

In conjunction with the data center consolidation effort, the NRC recently awarded a performance-based IT Infrastructure Services and Support (ITISS) contract to provide the full scope of infrastructure services and support.

The NRC currently manages its infrastructure through a series of contracts. The largest of these, the Integrated Services and Support contract, is primarily used for seat management; server support for standard, enterprise applications; and IT infrastructure research, development, and testing. Other contracts currently providing infrastructure services include Data Center Facilities Operations, Data Center System Administration, Wireless Telephone Services Management, Nuclear Security and Incident Response Operations Center Network Management, Safeguards for Wireless Local Area Network, and Emergency Response Data System. The NRC intends to consolidate these contract services into the ITISS contract as appropriate. This will effectively provide a method of offering shared services for the enterprise in a consistent and efficient manner.

This acquisition includes the following programmatic objectives:

- consistently providing IT infrastructure support at the required levels of service for the most reasonable cost
- maintaining a robust, secure computing environment that protects the information and users that the IT infrastructure supports
- innovation in the use of IT to increase the productivity of agency users, improve the agency's security posture, and reduce the cost of services provided while maintaining customer service expectations
- establishing an IT infrastructure that can adapt to changes in requirements and priorities
- evaluating the NRC IT infrastructure environment and making specific recommendations for how the agency can better use existing services in different ways that better serve the needs of its users
- managing an accurate, reliable, and complete inventory of IT assets

The statement of work for the ITISS contract includes tasks under which the contractor will propose innovative technologies and solutions that would provide greater efficiencies (including "green improvements" that would decrease the environmental impact of NRC work practices).

The NRC is also taking advantage of other Federal contracts and mandates to provide services consistent with other Federal agencies. In FY 2011, the NRC transitioned services to the WITS3 and Networx contracts and implemented Trusted Internet Connection services. Additionally, the NRC is considering Government provided and commercial cloud based services where appropriate.

4 Agency Approach, Rationale, and Timeline

The increase in new reactors has required the Agency to expand its staffing level and strengthen the need for a more robust IT infrastructure to ensure the Agency can meet its mission. The Agency is consolidating staff from several interim buildings to allow staff to work better together and save on lease and related other costs, such as Telecommunication circuits, shuttle bus service, etc. The activity which has provided a need to move and consolidate Data Centers.

The NRC currently has three production data centers in use in the Rockville, MD, area, These data centers range significantly in size and age. Agency business requirements call for a robust IT infrastructure to ensure that the agency can meet its mission. A key requirement in the consolidation of data centers is a modern, upgraded physical plant that will support the current and future demands of agency IT systems.

In order to simplify data center consolidation, the NRC has been assertive in consolidating applications since issuance of the 2010 report. As of June 2011, the NRC had virtualized 21 percent of the Microsoft Windows servers. In addition to saving power, this measure has

resulted, in some cases, in the virtualization of applications running on older server hardware and the subsequent retirement of the legacy hardware. This has resulted in a reduction in demand on the data center cooling units, which allowed the NRC to operate during the record high temperatures of summer 2011 without any outages. The staff anticipates that further server virtualization will facilitate the retirement of additional older, power inefficient servers, yielding additional energy savings.

Finally, in order to gather additional quantitative data on the success of consolidation and modernization efforts, the NRC has implemented a COTS hardware and software solution in the data centers to provide visibility into power use and data about environmental conditions. The staff will establish additional metrics specific to activities supporting this data center consolidation initiative to measure progress towards meeting the goals and objectives outlined in the plan.

The NRC expects to realize the following benefits from data center consolidation, virtualization, and other improvements:

- a common, uniform architecture for providing shared services to the enterprise
- a 10-percent reduction in energy costs
- reduced facilities and server maintenance and operations costs
- improved, consistent facility and IT security
- additional quantitative data related to energy usage and environmental factors
- consolidated contract services
- improved automation for server management and provisioning
- higher capability and robusted
- ability to be more agile
- ability to better support remote users

5 Agency Governance Framework for Data Center Consolidation

The governance framework for the NRC data center consolidation largely takes advantage of existing, established investment and IT governance bodies and processes.

The NRC ensures that IT investments are managed to maximize value, assess potential risks, and manage performance in accordance with Federal statutes and regulations. The NRC IT governance structure uses a hierarchy of IT governance boards to promote the appropriate transparency, accountability, and oversight of agency capital IT investments. The NRC governance framework includes the Executive Steering Committee, the IT Senior Advisory Council, the IT Business Council, and established working groups that support and inform the governance processes.

The NRC's IT governance boards were established to provide executive management review and oversight of all IT investments. As such, the IT governance process is an integral part of the Data Center Consolidation Project, providing management oversight, direction, and financial monitoring of all activities associated with the planning and implementation of consolidation solutions. The process will ensure the following:

- selection and approval of IT investments based on their alignment to the NRC's strategic goals, business needs, and the agency enterprise architecture to control risks and costs

- establishment of priorities for IT investments that support optimal use of agency resources

- adherence to established controls and checkpoints to monitor IT investment performance to ensure that the investments are managed effectively and are achieving the expected results of consolidation

The Computer Operations and Telecommunication Branch (COTB) within the NRC's Office of Information Services will serve as the lead branch for data center consolidation initiatives, coordination of consolidation related activities, and measurement of data center consolidation progress. Funding decisions for the consolidation effort will be reviewed and approved by an executive steering committee and go through the Agency's budget process.

As part of the planned contract services consolidation, the NRC will have clear service level requirements related to data center monitoring, management, and performance. Additionally, the NRC is establishing clear service level agreements (SLAs) with application owners throughout the agency. COTB has established a set of milestones to track and manage activities directly related to data center consolidation. In addition, COTB will develop key performance indicators with corresponding targets to measure progress towards goals specified in this plan. These baseline milestones and performance indicators will be tracked and monitored through the agency's data center schedule.

5.1 Cost-Benefit Analysis

Beginning in 2006, the NRC workload began to expand significantly to support new reactors, necessitating a large increase in the number of headquarters staff and contractors. The NRC began to work with GSA on a long-term housing plan to obtain sufficient permanent office space near the White Flint Complex to re-consolidate the headquarters staff and decompress the work environments. This strategy not only satisfied savings with real estate leases, it also provided a mechanism to improve our operational infrastructure to support the Agency's 24x7 Emergency Operations Center and building a new Green IT Data Center.

Several options were submitted to the NRC Chairman using cost-benefit estimates for the project requesting a decision on which housing strategy should be implemented and whether or not to move the Data Centers.

Option 2, which included moving the Data Centers, was selected because it was the most cost effective and operationally beneficial solution in cost sharing of facility cooling, power, network connectivity, etc., reducing overhead cost, centralizations and reducing cost of telecommunication circuits, and reduction in campus size.

This analysis was based on the following principles and guidelines:

- Provision of a Nuclear Emergency Operations Infrastructure that support backup heating, ventilation, air conditioning, electrical, and fire suppression capabilities to sustain 24-hour operations in the event of loss of power, water, or both
- Consolidation of staff located in NRC interim buildings to an expanded White Flint Complex.
- Compliance with Executive Order (E.O.) 13514, Federal Leadership in Environmental, Energy, and Economic Performance to reduce energy consumption and water use,

increased renewable energy, and use building materials that contribute to reducing greenhouse gases.
- Provision of security measures that comply with Interagency Security Committee (ISC) Level IV criteria for Federally occupied buildings

The construction and build-out of the new Data Center requires a significant investment, approximately 12.5M plus 4.5M for occupancy and transition. The ROI related to this cost will be realized over many years, well beyond FY2015. The NRC does not have a baseline for power and cooling since these items were not previously monitored. There will be initial costs savings to offset a percentage of this investment as the three current data centers are consolidated in the new data center and as other cost savings technologies (e.g. virtualization) are introduced. Additionally, in all years, applicable technologies like Cloud Computing will be considered in development and consolidation activities and implemented when appropriate.

5.2 Risk Management and Mitigation

The NRC uses a risk-averse project management approach. Risk identification takes place throughout the project life cycle, starting at the project initiation and planning stages, during which initial risks are identified and mitigation measures are developed and documented. As the project matures and external and internal situations change, the agency will identify, classify, and track additional risks and implement mitigation strategies as needed. We also use lessons learned, best practices from the States and other Federal Agencies and Private Industry.

The staff manages risks by identifying, assessing, and tracking potential threats to project success. When the staff identifies a risk, it categorizes and tracks the risk based on criteria that include the likelihood of occurrence and the impact on the project, component or system, or data center. Mitigation plans are developed to address threats judged as high risk based on these criteria. This helps ensure that proper and timely mitigation efforts are planned and carried out so that the resulting project is delivered within the given timeframe and meets the required standards.

As part of the NRC's risk management process, the staff has put in place a risk management plan that defines the processes for identifying risks, assessing their impact, and assigning responsibility to those who will monitor individual risks for possible occurrence and to those who will activate mitigation or contingency plans should the risks occur. The relative ranking of risks is reassessed periodically, and mitigation plans are updated accordingly. To achieve this objective, the risk management plan identifies and outlines project stakeholder roles and responsibilities for each risk management task. In accordance with the NRC's standard process for risk management, any critical component or system level risks will be reported to IT management.

Key risks identified for the Data Center Consolidation Project include the following:

- lack of funding and resources to support initial consolidation efforts and proper build out of the new data center
- possible delays in construction schedule
- timing issues related to contract consolidation and transition

Risk management is an ongoing process and is deemed essential to ensure the success of the overall project. The early identification of project risks is paramount to the success of any project in that it provides sufficient time to analyze, plan, monitor, and control risks.

5.3 Acquisition Management

The multiyear ITISS contract discussed in Sections 3 and 5.1 will enable the NRC to consolidate a number of support services into a single contract vehicle. A multiyear effort is now underway to fold all operational support services into this new contract. The staff anticipates that the agency will gain cost efficiencies by leveraging across applications and driving towards a commonly architected solutions environment (e.g., consolidation of storage and server platforms, backup, archiving and recovery services).

Separately, the agency is considering an expansion of its reliance on cloud applications through the use of Line-of-Business and Centers of Excellence from other Government agencies, as well as commercial hosting facilities. For example, the NRC already uses other Government agencies to provide mainframe computing services (e.g., the U.S. Department of Health and Human Services' National Institutes of Health and the U.S. Department of the Interior's National Business Center for payroll and financial management systems).

5.4 Communications Strategy

The NRC has a well defined communications program. We are using a multitier approach to ensure that effective communication strategies are implemented throughout the consolidation project and that senior management and agency leadership remain well informed.

The formal communication plan will include the following elements; goals, key messages, background, audience, communication tools and timeline.

Currently, key members of the FDCCI Consolidation Project Management Team meet twice monthly to provide project status updates and discuss project related issues and challenges. Additional informal meetings and teleconferences take place as needed to facilitate the necessary coordination to manage the magnitude and complexities of the project's scope.

In addition to the FDCCI Consolidation Project Management Team, the NRC has established other key internal and external project stakeholder groups. These groups have appointed project management or project representation teams to ensure that their respective needs and requirements are properly addressed. Each of these project stakeholder groups has established similar communication strategies, and the FDCCI Consolidation Project Management Team and these various project stakeholder groups meet weekly. Additional ad hoc meetings and teleconferences take place as needed to facilitate the necessary coordination.

Key members of the FDCCI Consolidation Project Management Team meet weekly to brief senior management. Topics covered include project status, project risks and proposed mitigation strategies, and budget issues and constraints.

As previously stated in Section 5, the NRC IT governance structure has implemented a hierarchy of IT governance boards to promote appropriate transparency, accountability, and oversight of the agency's capital IT investments. This governance framework includes the Executive Steering Committee, comprising senior agency leadership. This committee meets

every month and more frequently if needed. Each week, senior management and key members of the FDCCI Consolidation Project Management Team brief members of the Executive Steering Committee on the overall health of the project and address any issues or concerns.

This multitier, hierarchical communication strategy including the established meetings above will ensure that necessary project information is effectively communicated throughout all levels of management and to all project stakeholders.

6 Progress

6.1 FDCCI Consolidation Progress

Since the NRC does not plan to close the first data center until FY 2013, the NRC's FY 2011 consolidation targets focused on goals achieved through server virtualization. To that end, the agency has far exceeded the initially proposed goals for server reduction. For example, at the beginning of the fourth quarter of FY 2010, the NRC had set a goal for the quarter to reduce servers by 10 percent. By employing a very aggressive virtualization schedule, the NRC achieved a reduction of more than 11 percent (33 physical servers).

The NRC is currently on track to meet the planned consolidation targets for FYs 2012–2015. The main item on the critical path to data center consolidation is the timely completion and population of the new HQ campus building. To date, the main challenges relate to budget, resources, and managing the level of coordination required given the number of internal and external entities involved in facilities, data center, and IT planning and the related activities that need to happen simultaneously.

6.2 Cost Savings

As noted in Section 6.1, the NRC's consolidation targets for 2011 focus on goals achieved through server virtualization, since closure of the first data center closure will not occur until FY 2013. To that end, the agency has exceeded the initially proposed 2011 goals of server reduction, resulting in a cost savings of $64,506, as shown in Table 2.

Table 2 FY 2011 Savings

	Quantity	Avg. Amp Draw	Cost per kWh	Total Power Cost Saved per Year	Avg. Maint. Support Cost per Server	Total Maint. Cost Saved per Year	Total Cost Savings
Old servers removed from Prod, Test, & CTF environments through virtualization	53	2.75	$ 0.13	$ 19,917.61	$ 495.00	$ 26,235.00	
New servers avoided in Prod, Test, & CTF environments through virtualization	25	1.75	$ 0.13	$ 5,978.70	$ 495.00	$ 12,375.00	
Subtotals	78			$ 25,896.31		$ 38,610.00	$ 64,506.31

Moving forward, the agency will continue to pursue cost savings by promoting green IT design solutions in the consolidated data center. This should reduce the total cost of ownership through more efficient power management and the use of more energy efficient IT hardware and data center cooling solutions. The NRC also continues to aggressively pursue further sever reduction through virtualization.