U.S. NUCLEAR REGULATORY COMMISSION

DIRECTIVE TRANSMITTAL

TN: DT-99-12

To:	NRC Management Directives Custodians
Subject:	Transmittal of Management Directive 2.1, "Information Technology Architecture"
Purpose:	Directive and Handbook 2.1 are being issued to implement responsibilities and authorities, polices and procedures, and areas of coordination for budgeting and funding investments in information technology in compliance with the agency's information technology architecture and standards as required by the Clinger/Cohen Act of 1996. This directive replaces Manual Chapter 0903.
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Information Technology Architecture

Directive

(Formerly MC 0903) 2.1

Contents

Information Technology Architecture
Directive 2.1

Policy
(2.1-01)

The policy of the U.S. Nuclear Regulatory Commission is that investments in information technology be made in compliance with the agency's information technology architecture (ITA) as required by the Information Technology Management Reform Act (also known as the Clinger/Cohen Act of 1996).

Objectives
(2.1-02)

The objectives of this directive are to—

- Reduce the overall costs of agency investments in information technology. (021)

- Ensure that NRC's information technology application systems are compatible and work effectively within the agency's information technology infrastructure. (022)

- Improve information quality and access and reduce unnecessary duplication of information resources through implementation of an agency data administration program. (023)

Objectives
(2.1-02) (continued)

- Ensure that compliance with ITA and standards is an integral part of NRC's information technology investment planning and acquisition processes. (024)

Organizational Responsibilities and Delegations of Authority
(2.1-03)

Chief Information Officer (CIO)
(031)

- Develops, maintains, and implements sound, cost-effective, and integrated ITA that supports NRC's mission. (a)

- Ensures that policies, plans, and procedures related to NRC's ITA are consistent with Federal statutes, regulations, and policies related to information technology. (b)

- Reviews and has final authority to grant or refuse waivers to system, technology, and data standards. (c)

- Establishes processes to manage change and resolve architectures and standards issues. (d)

- Seeks advice, as necessary, from the Executive Council and other appropriate advisory bodies regarding the NRC mission and business impacts of proposed changes to the ITA. (e)

- Establishes an agencywide data administration program to promote data integrity and quality, including establishing data stewardship standards and practices. (f)

Organizational Responsibilities and Delegations of Authority
(2.1-03) (continued)

Chief Information Officer (CIO)
(031) (continued)

- Approves the appointment of data stewards designated by each office or region. Periodically certifies each data steward on the basis of conformance with data stewardship goals and requirements. (g)

- Evaluates new technologies and identifies new opportunities for applying information technology to the agency's business functions. (h)

- Provides appropriate training on NRC's ITA. (i)

Office Directors and Regional Administrators
(032)

- Ensure that IT acquisitions (including BankCard purchases), system development projects, and other IT related activities in NRC offices comply with ITA, or request a change to the architecture or a compliance waiver from OCIO. (a)

- Ensure that the effect of office-sponsored systems or other IT initiatives on ITA are identified and planned through the agency's information technology capital planning and investment control (CPIC) process described in MD 2.2, “Capital Planning and Investment Control.” When an office develops or modifies a system or implements new business practices, the effect of those changes may create a need to change the agency's ITA and change systems and practices

Organizational Responsibilities and Delegations of Authority
(2.1-03) (continued)

Office Directors and Regional Administrators
(032) (continued)

in other NRC offices. Other offices should work with OCIO and appropriate stakeholders to identify the effects on agency ITA and legacy systems. Offices may request specific compliance waivers from the OCIO, if necessary. Offices will ensure that the following are documented in the CPIC analysis for proposed projects: (b)

- Additions or changes to agency infrastructures, data models, standards, tools, or methodologies required by the project (i)

- Legacy system upgrades that are now required because of effects of the project (ii)

- Funding requirements in the sponsoring office, in OCIO, and in other shareholder offices needed to accommodate these changes or waivers (iii)

- Ensure that data about individuals covered by the Privacy Act of 1974, as amended, are maintained, collected, used, and disseminated in accordance with MD 3.2, “Privacy Act.” (c)

- Accept accountability and ownership of data required or created by the office or region, as negotiated with OCIO staff. (d)

Organizational Responsibilities and Delegations of Authority
(2.1-03) (continued)

Office Directors and Regional Administrators
(032) (continued)

- Designate office representatives to serve as data stewards. (e)
- Ensure that office or regional business data are managed by office and regional data stewards in conformance with NRC data administration policies, procedures, and standards. (f)
- Ensure that designated data stewards receive appropriate training under the guidance of OCIO staff. (g)

Applicability
(2.1-04)

The policy and guidance in this directive apply to all NRC employees and to all NRC contractors to whom they apply as a condition of a contract or purchase order.

Handbook
(2.1-05)

Handbook 2.1 is an overall reference to NRC ITA components and how they are used in the agency. See the OCIO Web page for the most current information.

Definitions
(2.1-06)

Applications systems inventory. An inventory of information technology systems and databases.

Definitions
(2.1-06) (continued)

Attribute. An item of data, a fact, or a single piece of information about an entity that quantifies, identifies, or describes an entity. An attribute is the analog in the logical data model to a column in the physical data model. Other approximate physical synonyms include field and property.

Capital planning and investment control. A management process for evaluating information technology projects, required by the Clinger/Cohen Act of 1996. Most proposed information technology projects are subject to the new process that supports a disciplined and structured review of proposed information technology investments. See NRC's Web site at http://irm12.nrc.gov/OCIO/ for additional information.

Data administration. The overall task of planning and managing NRC's data resources.

Data steward. An individual charged with monitoring and ensuring the accuracy, timeliness, and compliance of a designated subset of NRC data with information technology standards.

Entity. A type or category of person, place, thing, concept, or event about which a business retains information. An entity is the analog in the logical data model to a table in the physical model. Other approximate physical synonyms include file and record type.

Information technology. Any equipment or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception

Definitions
(2.1-06) (continued)

of data or information by a Federal agency, or under a contract with a Federal agency, that requires the use of this equipment or requires the performance of a service or the furnishing of a product that is performed or produced making significant use of this equipment. The term includes computers, ancillary equipment, software (including scientific codes) and similar procedures, services, (including support services), and related resources.

Information technology architecture (ITA). Defined by the Clinger/Cohen Act of 1996 as "an integrated framework for evolving or maintaining existing information technology and acquiring new information technology to achieve the agency's strategic goals and information resources management goals" (Section 5125 (d)). See NRC's Web site at http://irm12.nrc.gov/OCIO/ for detailed guidance.

Information technology resource acquisitions. These include obtaining information technology resources from sources external to the agency such as through contracts, Governmentwide information technology acquisition programs, and interagency agreements, as well as through in-house sources.

Infrastructure. The essential set of information technology resources shared by many applications. It includes physical components such as computers, networks, operating systems, generic commercial-off-the- shelf applications, and support services.

NRC physical technology architecture. A model of the NRC hardware, software, and communications environment. It describes infrastructure and capabilities that support the NRC application system, databases, and end users.

References
(2.1-07)

Information Technology Management Reform Act, dated February 10, 1996 (also known as the Clinger/Cohen Act of 1996 [Pub. L. 104-106]).

NRC Management Directive—

2.2, “Capital Planning and Investment Control.”

2.4, “Acquisition of Information Technology Resources.”

2.5, “NRC Information Systems Development Life Cycle Management.”

Office of Management and Budget (OMB) Circular A-130, Management of Federal Information Resources, as revised February 8, 1996.

Office of Management and Budget (OMB) Memorandum 97-02, Funding Information Systems Investments, October 25, 1996.

Office of Management and Budget (OMB) Memorandum M-97-16, Information Technical Architectures, June 18, 1997.

Information Technology Architecture

Handbook

(Formerly Appendix 0903)

2.1

Contents

Information Technology Architecture

Information technology architecture (ITA) describes the relationships among the work the agency does, the information the agency uses, and the information technology the agency needs. ITA also includes standards for designing new systems and provides the technology vision for making information technology investment decisions. This handbook is an overall reference to NRC information technology architecture components and how they are used in the agency. Consult the OCIO Web page at http://irm12.nrc.gov/OCIO/ for the most recent information.

Purpose of the ITA (A)

The ITA—

- Ensures integration and interoperability of technology in the NRC information technology environment (1)
- Reduces agency costs for data entry and maintenance; information technology development, maintenance, and operation; and training and support (2)
- Increases productivity by improving the quality of information and ensuring users have easier access to information (3)

Uses and Users of the ITA (B)

The ITA is used as— (1)

- A planning tool by sponsors, staff in the Office of the Chief Information Officer (OCIO), and the NRC Information Technology Business Council during the capital planning and investment control selection process to ensure that proposed

Uses and Users of the ITA (B) (continued)

information technology projects conform to the ITA and avoid overlap and duplication (a)

- An acquisition tool by project managers, contracting officials, and BankCard holders to ensure that newly acquired information technology will work well in NRC's environment (b)

- A development tool by developers to understand the existing information technology environment and to effectively integrate new technology into that environment (c)

- A management tool by OCIO staff to avoid costs for noncompliant, nonsupportable technology (d)

- A quality assurance tool by data stewards and OCIO staff to protect and manage the agency's data resources (e)

ITA Components (C)

There are eight components in the NRC ITA. These components are models, standards, and inventories. The following are brief descriptions of each ITA component. See the exhibit to this handbook, which shows how each ITA component is used during the applications system life cycle.

Models (1)

- *NRC Enterprise Model (EM) (a)*

  The EM is a model of NRC business functions and processes with information technology systems mapped to the business functions they support. (i)

ITA Components (C) (continued)

Models (1) (continued)

NRC sponsors and OCIO technical staff use the EM to identify systems that support business areas or individual business functions. The model is used to identify overlap and redundancy of existing automation and control and to identify areas that lack or have limited automation. (ii)

The Planning and Resource Management Division, OCIO, is responsible for this model. (iii)

- *NRC Strategic Data Model (SDM) (b)*

  The SDM is a model of NRC data entities with entities mapped to the business functions and applications systems they support. (i)

  NRC project managers and OCIO technical staff use the SDM to create data plans for individual systems. It is used to prevent overlapping or redundant definitions of data entity and attribute levels by different systems. As part of systems development life cycle management, project managers will update the SDM to reflect new systems and entity usage. (ii)

  The Planning and Resource Management Division, OCIO, is responsible for this model. (iii)

- *NRC Consolidated Data Model (CDM) (c)*

  The CDM is a detailed inventory of standard data entities and attributes. (i)

  Systems projects must use standard names and attributes for standard data. Projects must use existing standards or coordinate changes with the appropriate data steward. Projects

ITA Components (C) (continued)

Models (1) (continued)

will update the CDM with new entities created for the project to prevent entity and attribute level redundancy. Use the data dictionary as the source of practice and strategy. (ii)

The Planning and Resource Management Division, OCIO, is responsible for this model. (iii)

- *NRC Physical Technology Architecture (d)*

  The NRC physical technology architecture is an architectural model of the physical information technology layer, including hardware, software, and communications (networks, protocols, and nodes). It describes infrastructure and capabilities that support the NRC application systems, databases, and end users. (i)

  OCIO staff and contractors use this document to plan infrastructure. (ii)

  The Information Technology Infrastructure Division, OCIO, is responsible for this document. (iii).

Standards (2)

- *NRC Systems Development Life Cycle Methodology (SDLCM) (a)*

  The SDLCM is a set of procedures for planning, developing, implementing, and decommissioning information technology systems. It includes processes for ensuring compliance with and maintenance of EM and the technical reference model (TRM). (i)

ITA Components (C) (continued)

Standards (2) (continued)

NRC project managers use the SDLCM to develop new systems. (ii)

The Applications Development Division, OCIO, is responsible for this document. (iii)

- *NRC Technical Reference Model (TRM) (b)*

  The TRM is a framework of technical standards used at the NRC that is based on the National Institute of Standards and Technology's Open Systems Applications Portability Profile. These standards are divided into the following eight service areas: (i)

  – Operating systems (*a*)

  – Human/computer interfaces (*b*)

  – Application development (*c*)

  – Data management (*d*)

  – Network information networks (*e*)

  – Security (*f*)

  – Data interchange and presentation (*g*)

  – Office automation (*h*)

  NRC project managers and OCIO technical staff use this model to plan the platforms and infrastructure for new systems.

ITA Components (C) (continued)

Standards (2) (continued)

Acquisition of information technology components other than those specified in the TRM requires OCIO review. (ii)

The Planning and Resource Management Division, OCIO, is responsible for this document. (iii)

- *NRC Data Administration Reference Manual (c)*

  The NRC Data Administration Reference Manual is a set of standards and procedures for administrating data management for all agency information technology systems, including processes for ensuring compliance with and maintenance of the agency SDM and CDM. (i)

  The OCIO technical staff and data stewards use this document to manage agency data. (ii)

  The Planning and Resource Management Division, OCIO, is responsible for this document. (iii)

- *NRC Data Architecture Naming Standards and Conventions (d)*

  The NRC Data Architecture Naming Standards and Conventions is a set of standards to be used in creating names for data entities and defining attributes. (i)

  The OCIO technical staff and data stewards use this document to coordinate data names. (ii)

  The Planning and Resource Management Division, OCIO, is responsible for this document. (iii)

ITA Components (C) (continued)

Inventories (3)

The NRC ITA database is a database of information technology systems, and databases used for change management, integration and retirement of legacy systems, and ITA compliance certification. (a)

NRC project managers and OCIO technical staff use the ITA database to track the status of systems during their life cycle, plan system retirements, and report on systems. Managers with automation requirements may use the ITA database to see if a system already exists that meets their requirements. New projects can use the ITA database to plan for integration with existing systems and retirement of legacy systems. (b)

The Planning and Resource Management Division, OCIO, is responsible for this database. (c)

Other Processes That Use the ITA (D)

The NRC ITA is used by other agency processes that are fully documented in separate management directives. Brief descriptions of these related processes follow.

NRC Information Technology Capital Planning and Investment Control (1)

Part of the IT capital planning and investment control process is evaluating the relationship of the proposed system to other systems using the EM and other information in the NRC ITA database and evaluating its impact on the information technology infrastructure using the TRM. A set of procedures for planning and managing information technology investments is contained in Management Directive (MD) 2.2, “Capital Planning and Investment Control.”

Other Processes That Use the ITA (D) (continued)

NRC Information Technology Acquisitions (2)

Part of the IT acquisition process is ensuring that acquisitions comply with the TRM. A set of policies and procedures for information technology acquisitions is contained in MD 2.4, "Acquisition of Information Technology Resources."

Architectural Components (E)

The Office of Management and Budget (OMB) defines components that must be present in an effective agency architecture. The relationship of NRC ITA components to Federal ITA is shown below.

Compliance With OMB ITA Requirements	
OMB ITA Components	**NRC ITA Components**
Business Processes	Enterprise Model
Info Flow & Relationships	Strategic Data Model
Applications	ITA Database
Data Description and Relationships	Strategic Data Model
Technology Infrastructure	Physical Technology Architecture
Technical Reference Model	Technical Reference Model
Standards Profiles	Technical Reference Model
Security Standards Profiles	Technical Reference Model
ITA Change Management	SDLCM
ITA Legacy System Integration	EI/IM Plan
IT Personnel Planning	Executive IT Training
ITA Compliance & Certification	Capital Planning and Investment Control Process

Exhibit
Use of ITA Components During the Applications Systems Life Cycle

ITA Component	Planning	Acquisition	Development	Operations & Maintenance	Decommissioning
Enterprise Model (EM)	Identify related applications and stake-holders to avoid duplication	N/A	Ensure new application integration with existing applications	Refer and update information	Refer and update information
NRC Strategic Data Model (SDM)	Identify date entities for proposed projects. Consult with data stewards for duplication	N/A	Ensure new data integration with existing data	Refer and update information	Refer and update information
NRC Consolidated Data Model (CDM)	Review data dictionary for standard data entities. Consult with data stewards for changesand updates.	N/A	Update CDM with new entities; use the data dictionary as the source of practice and strategy	Refer and update information	Ensure shared data entities are not deleted
NRC Physical Technology Architecture (PTA)	Ensure proposed alternatives comply with physical infrastructure	Ensure acquisitions comply with physical infrastructure	Ensure new applications compatibility with physical infrastructure	Refer and update physical infrastructure information	Refer and update physical infrastructure information

Exhibit (continued)

ITA Component	Planning	Acquisition	Development	Operations & Maintenance	Decommissioning
NRC Systems Development (SDLCM)	Use standard procedures for planning new systems	Use standard contract vehicles as specified in SDLCM	Use standard procedures for developing new systems	Use standard procedures for maintaining current systems	Use standard procedures for decommissioning systems
NRC Technical Reference Model (TRM)	Ensure proposed alternatives comply with technology standards	Ensure acquisitions comply with technology standards	Ensure new applications compatibility with information technology environment	Refer and update information	Refer and update information
Data Administration Handbook	Ensure proposed data comply with agency SDM and CDM; negotiate necessary compromises with existing sponsors and the CIO	Ensure software, hardware, and contractor skills purchased allow for compliance with data standards	Ensure new data entities and elements comply with agency data standards; negotiate necessary compromises with existing sponsors and the CIO	Ensure new data elements comply with agency data standards; negotiate necessary compromises with existing sponsors and the CIO	Ensure shared data elements are not deleted; negotiate necessary compromises with existing sponsors and the CIO
NRC ITA Database (ITAdb)	Use to see if a system already exists; plan for integration and retirement	Ensure acquisitions integrate with existing systems	Use to track the status of developing new systems	Use to track and report on current systems	Use to plan system retirements