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Title: Technology Infusion Process
Revision: 09/09/2003
The BWXT Y-12 Technology Infusion Process is the mechanism for successful development and deployment of new technologies into Manufacturing.

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BWXT Y-12, L.L.C.
Management Requirements

Number: Y15-706
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BWXT Y-12
Procedure

Subject: Technology Infusion Process

M. L. Baker /s/ — 09/23/03
Written By/Signature/Printed Name — Date

Approvals: **[Approved Signatures and Dates on File]**

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Executive Manager/Signature/Printed Name — Date

10/30/03
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Concurrence:

This document has completed the management requirements process.

Clarence C. Hinton /s/ 09/23/03
Requirements Management

This document has been reviewed by an Authorized Derivative Classifier and UCNI Reviewing Official and has been determined to be UNCLASSIFIED and contains no UCNI.
This review does not constitute clearance for public release.

M. L. Baker /s/ 09/23/03
Signature and Date

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Revision Date	Description of Change	Pages Affected
09/09/03	DM/R# DEV-03-003 Description: New procedure to document the requirements for successful development and deployment of new technologies into Manufacturing.	All

Subject: Technology Infusion Process

1.0 PURPOSE

The BWXT Y-12 Technology Infusion Process is the mechanism for successful development and deployment of new technologies into Manufacturing. The process provides a structured method of establishing company-level technical and R&D needs; demonstrating and documenting the scientific feasibility of new technologies; and demonstrating and documenting the technology under prototypical conditions for deployment.

This procedure formalizes the commitment by BWXT Y-12 senior management to organize the Technology Infusion Process to systematically modernize outdated technical processes, equipment, and supporting systems.

This procedure provides a clear and comprehensive description of the Technology Infusion Process and identifies the roles and responsibilities associated with the successful implementation of this process.

2.0 SCOPE

The Technology Infusion Process applies to BWXT Y-12 personnel, programs, or projects involving the development and deployment of new technologies into Y-12 manufacturing operations.

The process described in this procedure does not apply to technical consultations, projects aimed at optimization or troubleshooting of existing manufacturing processes, or work for other private and public sector entities, where their efforts are not aimed at the insertion of new technology into Y-12.

3.0 OTHER DOCUMENTS NEEDED

- Y13-007INS, *Executing Projects*

4.0 RESPONSIBILITIES

NOTE: An expanded list of deliverables is provided in Appendix A, *Technology Infusion Process Deliverables.* An expanded list of as roles and responsibilities is provided in Appendix B, *Technology Infusion Process Description*, Table 1.

Technology Council

1. Prepares a Technology Roadmap that identifies technical strategies to achieve plant performance and capability requirements.
2. Updates the Technology Roadmap on an annual basis.
3. Maintains a prioritized list of technology areas of interest to Y-12 and sponsors periodic technology assessments of these areas by the appropriate Y-12 technical organization(s).
4. Establishes organizational roles and responsibilities for technology development and deployment.
5. Evaluates the potential benefits, technical maturity, and project plan for a new technology and decides if the technology should proceed to a prototype demonstration (as described in Appendix B, Section 1.2.3, *Prototype Planning*).
6. Works with Program Operations and senior management, when required, to identify funding for prototype demonstrations.
7. Ensures membership communicates and implements Council decisions in their organizations.

Chief Scientist

1. Acts as a member of the Technology Council.
2. Advises senior management and the Technology Council on scientific issues pertaining to technology infusion.

4.0 RESPONSIBILITIES (cont.)

Project Lead

NOTE: In the early phase of technology infusion, the project lead will typically be the principal investigator. As the technology matures, project rigor increases and the lead will typically be a project manager assigned by the project management organization.

1. Establishes and leads the technical team, which includes as a minimum:

   - Principal Investigator (PI),
   - Operations/system owner's representative, and
   - Design Authority Representative (DAR) for the implementation area.

2. Expands the team and ensures involvement of other plant organizations as needed.

3. Prepares project plans and technical documents as specified in Appendix A, *Technology Infusion Process Deliverables*, and/or as required by existing project management procedures. Further clarification of the information in Appendix A can be found in Appendix B, *Technology Infusion Process Description.*

4. Obtains peer review of project plans and technical documents.

Technology Organization Manager or Designee

NOTE: The Technology Organization Manager is the D-1 manager (reporting to a Division Manager) responsible for the organization that is developing the technology.

1. Appoints the Principal Investigator/team leader.

2. Approves project plans and technical documents specified in Appendix A

3. Ensures that the requirements of the Technology Infusion Process are incorporated into the plans and procedures (e.g., Conduct of R&D) of the executing technology organization.

4.0 RESPONSIBILITIES (cont.)

End-User Organization Manager

NOTE: The End-User Organization Manager refers to the D-1 manager of the organization in which the technology will be deployed or the Director's designee.

1. Ensures the operating organization receiving the technology provides input to the project team throughout the Technology Infusion Process.

2. Approves the Operations/system owner's representative on the technical team as required.

3. Approves the Prototype Project Execution Plan (PEP) and the Production Prototype Project Execution Plan prior to implementation decisions by the Technology Council.

Program Manager or Designee

1. Ensures that R&D proposals and project plans contain the minimum information specified in Appendix A

2. Approves project plans and technical documents specified in Appendix (with the manager of the executing technical organization).

5.0 RECORDS

Technology Council: Technology Roadmap

Principal Investigator: Technical Summary Reports

6.0 SOURCE DOCUMENTS

Technology Council Charter

APPENDICES

A. Technology Infusion Process Deliverables
B. Technology Infusion Process Description

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APPENDIX A
Technology Infusion Process Deliverables
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Phases	Technology Planning		Technology Development			Technology Demonstration	
	Needs Assessment	R&D Project Plan	Scientific Feasibility	Proof of Principle	Decision Point	Non-Production Prototype	Production Prototype
Responsibility	Technology Council	Principal Investigator	Principal Investigator	Principal Investigator	Technology Council	Project Team Leader	Project Team Leader
Project elements							
Identify manufacturing technology needs	x						
Identify site implementation strategies	x						
Project Proposal/Plan for next phase							
Discussion of specific technology need		x					
Crosswalk to technology roadmap		x					
Assess/update benefits to site			x			x	x
Assess/update manufacturing implementation issues			x			x	x
Define work scope and technical approach		x	x	x		x	x
Safety Review and work authorization		x	x	x		x	x
Identify/update project team		x	x	x		x	x
Define key milestones for next phase		x	x	x		x	x
Cost and schedule estimate for next phase		x	x	x		x	x
Establish/update general operating envelope				x		x	x
Develop/refine material balance				x		x	x
Estimate implementation costs and potential savings				x		x	x
Decision to proceed with prototype phase					**x**		
Complete preliminary design of prototype equipment				x		x	x
Prototype formal design review						x	x
Prototype start-up plan/first-use protocol						x	x
Process flow diagrams						x	x
Equipment list with proces descriptions for						x	x
Preliminary equipment layout/floorplan						x	x
Decision to proceed with manufacturing						**x**	**x**
Project Execution Plan for manufacturing						x	x
Major Deliverable	Technology Roadmap	R&D Project Plan	Technical Summary Report and POP Plan	Technical Summary Report and Prototype Plan	Decision to Proceed with Prototype	Design Documentation and Prototype Summary Document	Design Documentatin and Project Execution Plan
Approvals							
Technology Organization Management		x	x	x		x	x
Program Manager		x	x	x		x	x
Technical Peer Review				x		x	x
Technology Council	x				x	x	x

APPENDIX B
Technology Infusion Process Description
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1.0 PROCESS DESCRIPTION

The table in Appendix A provides a listing of the deliverables required by the Technology Infusion Process. The process is broken down into three major phases: Technology Planning (subdivided into Needs Assessment and R&D Project Plan), Technology Development (subdivided into Scientific Feasibility, Proof-of-Principle, and Prototype Planning), and Technology Demonstration (subdivided into Non-Production Prototype and Production Prototype). For each phase in the process, the table summarizes the lead or responsible organization, project elements, major deliverables, reviews, and approvals that are critical to successful technology infusion. Each of the three major phases is described below, and a flowchart for the overall Technology Infusion Process is provided in Figure 1.

The tables and figures summarize the entire Technology Infusion Process, starting with the identification of a technical need and ending with the deployment of a new technology at Y-12. It is recognized that in some cases the technology under development will be of sufficient maturity to enter the process in one of the later phases. To ensure that the information critical to successful technology infusion is assembled in such cases, it is the responsibility of the organization having the lead for the step where the technology enters the process to prepare the applicable documentation called out in the earlier phases. This will typically consist of the technical document identified as a major deliverable in the preceding step and the plan identified as a major input for the step at which the technology enters the process.

1.1 TECHNOLOGY PLANNING

1.1.1 NEEDS ASSESSMENT

The Technology Infusion Process commences with a needs assessment. The needs assessment is the responsibility of the Technology Council, and the major deliverables for this phase of the infusion process are the annual technology roadmaps and periodic technology assessments.

The top-level directions and performance requirements that drive technology decisions are specified by senior management. This top-level information is provided to the Technology Council, which is responsible for providing a clear direction for technology at Y-12. The committee uses a process called technology road mapping to identify technical strategies and approaches that respond to Y-12 needs. These technology roadmaps provide the integrated technical needs assessment that is the starting point for technology infusion. The roadmaps are updated annually to reflect changes in technical approaches, needs, and drivers.

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1.1.1 NEEDS ASSESSMENT (cont.)

Awareness of changes in the state-of-the-art of key technical focus areas of interest to Y-12 is important for an effective Technology Infusion Process. As the state-of-the-art changes, new technologies and applications can become attractive to Y-12. The Technology Council, as part of its roadmap activities, maintains a prioritized list of technology areas of interest to Y-12 and sponsors periodic technology assessments of these areas by the appropriate Y-12 technical organization(s).

1.1.2 R&D PROJECT PLAN

The second step in the Technology Planning phase is the development of an R&D Project Plan to address an identified need for a new technology or process. Project plans are, in general, developed by the Y-12 technical staff and submitted to a Program Manager for consideration and funding. The specific format of the plan may differ depending on the program but, in all cases, must contain the following minimum information:

- Discussion of the technology need;
- Crosswalk to the Technology Roadmap;
- Definition of the scope of work and technical approach;
- Safety review and work authorization
- Identification of key milestones, the criteria for measuring successful achievement of objectives;
- R&D cost estimate and schedule; and
- Identification of the technical team.

The last requirement, identification of the technical team, is required to ensure that the proper organizations are represented from the beginning of the technology development effort. As the effort increases in size, maturity, and complexity, this team will transition into the "Project Team" defined in Y13-007INS, *Executing Projects*. The roles and responsibilities of the technical team members are provided in Table 1.

In most cases, the lead for the initial R&D activities will be the Principal Investigator appointed by the manager of the executing Y-12 technology organization (D-1) with approval of the Program Manager. Team membership will vary depending on the specific proposed work; however, the following representation is considered to be the mandatory minimum "core" team:

- Principal Investigator;
- Operations/system owner's representative; and
- Design Authority Representative (DAR) for the implementation area.

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1.1.2 R&D PROJECT PLAN (cont.)

Other organizations often need to be represented, and their involvement is determined based on the scope, interfaces, and needs of the activity. In cases where the core team does not include representation by Quality, Criticality Safety, and Facility Safety, it is the responsibility of the team leader to ensure that these organizations review and concur as appropriate with potential issues have been identified and are addressed in the R&D Project Plan.

As a result of programmatic requirements and responsibilities, the Program Manager or sponsor, while not considered part of the core team, is expected to participate heavily in project activities.

Technical peer review of the R&D Project Plan is encouraged. The technical peer review format may vary depending on the program but, as a minimum, should include an evaluation of:

- R&D objective(s) and consistency with the Technology Roadmap and program and customer needs;
- Technical approach to achieving objective(s);
- Basis for selection of technical approach (prior work, literature, etc.); and
- Technical risks associated with approach.

The Technology Planning phase concludes with the Program Manager's decision on funding of the R&D Project Plan. Funding by a Program Manger represents approval to move to the Technology Development phase. When funding is not made available for an R&D activity that the D-1 manager of the organization proposing the R&D believes is both consistent with the Technology Roadmap and addresses a high priority Plant need, the D-1 Manager will communicate this to the Technology Council for reevaluation and resolution. The Technology Council will work with Program Manager to develop a path forward.

1.2 TECHNOLOGY DEVELOPMENT

Acceptance and funding of the R&D Project Plan by a Program Manager represents approval for the Technology Infusion Process to move into the Technology Development phase. Technology Development typically proceeds first with a demonstration of the scientific feasibility of the approach and then moves to a proof-of-principle focused on establishing general performance parameters with laboratory-scale hardware.

1.2.1 SCIENTIFIC FEASIBILITY

The first step in the Technology Development phase is the demonstration of scientific feasibility. R&D is conducted to establish the scientific basis required to support preliminary assessments of

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1.2.1 SCIENTIFIC FEASIBILITY (cont.)

the feasibility and benefits of the technology. In addition to meeting the R&D milestones called out in the R&D plan, major milestones that must be met during this step include the use of the underlying science to conduct a preliminary assessment of the benefits of the technology, establishing the requirements for a proof-of-principle demonstration and, if required by the funding Program Manager, preparation of a project plan for the proof-of-principle.

The manager of the executing Y-12 technical organization, through the Principal Investigator (PI), is responsible for this phase of the infusion process. At the beginning of this step, the PI must establish the technical team as defined in the R&D Project Plan. The PI is responsible for ensuring that the technical team membership and its involvement in the development activity is sufficient to ensure that operations, engineering, ES&H, quality, and nuclear safety issues and concerns are raised, understood, and included in the planning for continued development.

The major deliverable from this step in the infusion process is a technical summary document. This is the beginning step in developing a full technical basis document for the technology and its deployment. The technical summary document must summarize the results of the scientific feasibility studies, relevant literature, and analyses based on this information sufficient to:

- Establish the scientific basis of the technology; and
- Provide a preliminary assessment of the benefits and technical issues of implementing the technology on the manufacturing vision, including the impact on key drivers such as cost, quality, ES&H, etc. This assessment should extend the analysis qualitatively presented in the R&D Project Plan to include the results of the feasibility study. Where possible, rough quantitative estimates of the cost and benefit of the technology should be made.

The PI is responsible for ensuring technical peer review of the feasibility document as necessary and resolving any issues raised by the review. If there are no significant feasibility concerns raised in the review, the technical team, with agreement of the funding program manager, may elect to proceed to proof-of-principle.

The PI and technical team must also develop a Proof-of-Principle Project Plan. The plan:

- Establishes the proof-of-principle milestones and requirements;
- Provides proof-of-principle budgets and schedules;
- Discusses operational implementation issues; and
- Establishes the technical team needed for the proof-of-principle demonstration.

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1.2.1 SCIENTIFIC FEASIBILITY (cont.)

In cases where a body of work already exists that clearly establishes scientific feasibility, this step may be skipped in favor of proceeding directly to proof-of-principle. Skipping the feasibility step requires a recommendation by the technical team and approval by the Program Manager. If the technology is judged sufficiently mature or the schedule requirement is such that taking additional deployment risk is justified, the Technology Infusion Process may start with the prototype technology demonstration described later in this document. However, when this is done, the technical team must prepare and document the information called for in each of the major deliverables of the skipped phases, as this documentation is an integral part of the infusion process and the development of the technical basis for a deployed system.

1.2.2 PROOF-OF-PRINCIPLE

The Proof-of-Principle phase represents the transition of the technology activity from establishing the necessary science to beginning the definition of the hardware to be deployed. The major deliverables from this step are a proof-of-principle summary document and plan for proceeding to prototyping.

The proof-of-principle demonstration will typically involve the use of laboratory or subscale hardware to understand and quantify technical and operational performance sufficiently to provide confidence in a preliminary prediction of the hardware, costs, and benefits of a prototype demonstration. The results of the proof-of-principle step are summarized in a proof-of-principle document. The document must contain information and analysis sufficient to:

- Establish the general operating envelope and technical issues for the process or equipment;
- Identify scale up requirements and issues; and
- Estimate implementation costs and potential savings. The cost benefit analysis should be extended to include the rough estimates of the full cost of developing and deploying the technology as well as the expected benefits based on the proof-of-principle demonstrations.

The PI is responsible for ensuring technical peer review of the proof-of-principle document and resolving any issues raised by the review.

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1.2.2 PROOF-OF-PRINCIPLE (cont.)

In addition to the proof-of-principle document, the technical team is also responsible for developing a Prototype Project Execution Plan. The Prototype Plan must contain the following key information:

- Identification of prototype milestones;
- Preconceptual design of the prototype – prototype budgets and schedules;
- Expanded technical team – project structure for the prototype demonstration; and
- Recommended path forward for demonstration of prototypical hardware (i.e., either a development or production prototype).

To ensure the participation and buy-in of the organization where the technology will be deployed, the manager of the end-user organization (D-1) must approve the Prototype Project Execution Plan. Approval by the Program Manager is also required.

The lead for this step in the infusion process remains with the executing Y-12 technology organization. It is the responsibility of the team leader or PI to ensure that the engineering, nuclear safety, and related organizational involvement is increased as required to successfully accomplish these efforts.

1.2.3 PROTOTYPE PLANNING

A critical step in the Technology Infusion Process is a clear decision that the technology has sufficient benefits and technical maturity that it is ready to move to prototyping. Prototyping represents a transition from a technology intense effort aimed at understanding the underlying science and demonstrating the technical concept to an engineering and operations intensive effort to develop and demonstrate deployable systems. A formal prototype decision is included in the Technology Infusion Process to recognize this change, ensure a smooth transition, and revalidate the need for the technology. The Technology Council is responsible for the prototype decision.

The preceding proof-of-principle step contains the specific deliverables of a proof-of-principle document and a Prototype Project Execution Plan that are designed to provide the basis for determining: (1) if the technology is ready to proceed to significant scale prototyping and deployment, (2) cost and benefits merit prototyping, (3) the best path forward for implementation, and (4) the recommended project structure.

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1.2.3 PROTOTYPE PLANNING (cont.)

The Technology Team provides and presents the Technology Council with these documents and any other supporting data that is needed. In considering the information presented, the Council takes into account the readiness of the technology, the importance and impact of the technology on Y-12 requirements, and the availability of funding. The Council decision has three elements:

- Accept or reject the recommendation to proceed with prototyping;
- Accept or require modification of the proposed prototype option; and
- Accept or require modification of the proposed project structure.

The decision of the Technology Council Committee is provided by letter to the project lead. The Technology Council maintains the record copy of the decision.

In cases where Technology Council accepts the recommendation to proceed with prototyping but funding is not available, the Council will work with Program Operations and senior plant management to identify a path forward for funding the prototype phase.

1.3 TECHNOLOGY DEMONSTRATION

The Technology Demonstration phase is the final step in the process before deployment. Prototypical hardware and operations are used to demonstrate the technology, assure scalability, and establish engineering specifications for production hardware. The Technology Demonstration phase may involve either a development (Path 1, Figure 1) or a production (Path 2, Figure 1) prototype or both (Path 3, Figure 1), depending on the maturity of the technology, the level of demonstration required to support deployment, and schedule and cost considerations.

1.3.1 NON-PRODUCTION PROTOTYPE

The intent of a non-production prototype is to demonstrate that the technology works at or near full-scale both in terms of the equipment and concept. When technical complexity is high and there is remaining uncertainty, such as in the specific level of full-scale performance parameters achievable, the Prototype Plan is likely to call for a prototype in a non-production area as opposed to a production prototype capable of full process prove-in and/or first production. While this type

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1.3.1 NON-PRODUCTION PROTOTYPE (cont.)

of prototype is located outside of an operating area and may involve the use of surrogate materials, it provides the large-scale, highly instrumented test bed needed to accomplish the following:

- Achieve technical milestones in the prototype plan;
- Develop process flow diagrams;
- Refine the operating envelop;
- Provide equipment lists and process descriptions;
- Develop material balances;
- Establish preliminary equipment layouts; and
- Develop a scale-up plan.

The project lead for a non-production prototype typically will remain with the technical organization that executed the proof-of-principle phase; but the team, consistent with a graded project management approach, will be expanded to include those organizations and resources identified in the Prototype Project Execution Plan as necessary to demonstrate the technology and concept.

The major deliverables for this phase is a prototype document that updates all of the information contained in the proof-of-principle document based on the results obtained during prototyping. This document must contain all of the information listed above.

The Technical Team must also prepare a Production Prototype Project Execution Plan for implementation in accordance with Plant Procedures (Y13-007INS and Y13-87-004). In addition to approvals required by this procedure, the manager of the receiving manufacturing organization must approve the Production Prototype Project Execution Plan. After proper approval, this project plan is presented to the Technology Council, makes the decision to proceed with a production prototype or move directly to deployment.

1.3.2 PRODUCTION PROTOTYPE

A production prototype may by itself or in combination with a non-production prototype be used as part of the technology demonstration phase. Unlike the non-production prototype, the production prototype is located in an operating area, uses production materials, and, as the final demonstration before full deployment, is conducted as a full project. The end-user organization will be responsible for a production prototype. The project lead for the design, installation and test and checkout will be a Project Manager or technical organization representative with equivalent training and expertise.

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1.3.2 PRODUCTION PROTOTYPE (cont.)

The production prototype milestones are the same as for a non-production prototype with the addition of project deliverables required in project management and conduct of engineering procedures.

The major deliverables are a prototype document and project documentation per procedure. The prototype document requirements are the same as for a non-production prototype but include the more detailed engineering and operations data consistent with a demonstration of a production capable system.

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Table 1: Roles and Responsibilities of Technology Team Members and Selected Y-12 Organizations
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	Technology Planning		Technology Development			Technology Demonstration	
Team Member	**Needs Assessment**	**R&D Project Plan**	**Scientific Feasibility**	**Proof-of-principle**	**Prototype Planning**	**Non-production prototype**	**Production Prototype**
Technology Council	• Defines and integrates strategies to develop and deploy new technologies • Prepares the annual technology roadmaps and technology assessments • Provides a Y-12 integrated long-term technical vision • Establishes strategies for delivering current and future capabilities • Establishes organizational roles and responsibilities for technology development and deployment • Ensures technology development and deployment is consistent with technology roadmaps				• Determines if the technology is ready to proceed to prototyping or deployment • Determines the best path forward • Recommends a project structure • Documents the prototyping decision		• Approves implementation in production areas

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	Technology Planning		Technology Development			Technology Demonstration	
Team Member	**Needs Assessment**	**R&D Project Plan**	**Scientific Feasibility**	**Proof-of-principle**	**Prototype Planning**	**Non-production prototype**	**Production Prototype**
Program Manager	• Identifies program needs	• Sponsors work • Approves Lead • Provides programmatic requirements • Monitors progress • Ensures that a technical peer review of the R&D project plan is completed • Approves R&D project plan	• Provides funding • Monitors progress • Approves the Technology Feasibility document • Approves the Proof-of-Principle Project Plan	• Provides funding to support the Proof-of-Principle Project Plan • Reconfirms programmatic requirements • Monitors progress • Approves the Proof-of-Principle Document • Approves the Prototype Project Execution Plan		• Provides funding to support the Prototype Project Execution Plan • Monitors progress • Approves Prototype Document • Approves the project plan	• Establishes funding • Requests project management support • Approves Prototype Document • Approves project documents per procedures
Technology Organization Manager		• Appoints Team Leader • Approves R&D Project Plan	• Approves the Technology Summary Report and the Proof-of-Principle Project Plan	• Approves the Proof-of-Principle Document and the Prototype Project Execution Plan		• Reviews Prototype Document and project plan	• Reviews Prototype Document
End-User Organization Manager				• Approves Prototype Project Execution Plan		• Approves Production Prototype Project Execution Plan	• Supports project team

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	Technology Planning		Technology Development			Technology Demonstration	
Team Member	**Needs Assessment**	**R&D Project Plan**	**Scientific Feasibility**	**Proof-of-principle**	**Prototype Planning**	**Non-production prototype**	**Production Prototype**
Project Lead (Principal Investigator or Team Leader)		• Prepares R&D project plan with the Y-12 Technical Staff	• Implements R&D project plan • Establishes and leads technical team • Ensures involvement of other plant organizations as needed and insures that related issues and concerns are addressed • Prepares Technical Summary Report and obtains technical peer review • Prepares a Proof-of-Principle Project Plan	• Implements the Proof-of-Principle Project Plan • Expands the membership of technical team to include such disciplines as Criticality Safety, Facility Safety, ES&H, Quality, and Engineering • Leads technical team • Prepares Proof-of-Principle Document • Obtains peer review for the Proof-of-Principle Document • Prepares Prototype Project Execution Plan		• Expands technical team to include project support personnel • Leads project team • Implements Prototype Project Execution Plan • Prepares Prototype Document • Prepares Project Execution Plan Plan	• Serves on project team per project management procedures • Prepares a Prototype Document • Completes an Operability Demonstration
Operations/ system owner's representative		• Assists in R&D Project Plan preparation and presentation	• Serves on the technical team • Provides input on operations needs and concerns	• Provides operations requirements • Identifies operations issues and concerns		• Provides operations requirements • Identifies operations issues and concerns	• Serves on project team per project management procedures

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	Technology Planning		Technology Development			Technology Demonstration	
Team Member	**Needs Assessment**	**R&D Project Plan**	**Scientific Feasibility**	**Proof-of-principle**	**Prototype Planning**	**Non-production prototype**	**Production Prototype**
Design Authority Representative		• Assists in R&D Project Plan preparation and presentation	• Serves on the technical team • Provides input on technical basis needs and concerns	• Provides input on technical basis requirements • Identifies engineering design disciplines required		• Maintains technical basis	• Maintains technical basis • Supports project team per project management procedures
Other plant organizations			• Serves on the technical team as requested • Provides subject matter expertise	• Expands participation on the technical team to include Quality, Criticality Safety, or Facility Safety as needed • Provides subject matter expertise		• Provides subject matter expertise	• Serves on project team per project management procedures
Planning and Integration				• Provides budget level estimates and schedules to the team leader		• Provides cost and schedule information as requested	• Serves on project team per project management procedures
Project Engineer						• Coordinates Engineering and Technology support	• Serves on project team per project management procedures
Project Management				• Provides project management advice to the team leader		• Provides project management advice	• Assigns project manager to lead project team • Implements project management procedures

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Figure 1: Technology Infusion Process Flow Chart