

TEMPORARY CHANGE REQUEST

TCR NO. **TCR-ENG-010,R6-004**

(e.g., TCR-ENG-021,R0-001)

The Temporary Change Request (TCR) Form is to be used to process urgent or minor changes for PPPL Policies, Organization/Mission Statements and Procedures. The TCR should be used when changes are:
1) urgent, and can not wait the 2-4 week period for Department Head review/comment, or
2) minor, and do not warrant Department Head review.

Person Requesting Change: Frank Malinowski Phone Ext: 2203

Department Name: Quality Assurance/Quality Control

Document Number: ENG-010 Revision No.: 6

Document Title: Control of Drawings, Software and Firmware

Reason for change:

To include NSTX-U responsible engineers in approval process of NSTX-U changes.

Change description: (Summarize and attach changed pages, with changes clearly indicated)

Added Responsible Engineer concurrence to procedure for ECN approval.

Added signature line to ECN form for Responsible Engineer concurrence.

1. Does this TCR significantly alter the intent or scope of the document? YES: NO: X

2. Does this TCR significantly impact ES&H? YES: NO: X

If 1 or 2 is YES, Explain why the changes should not be routed for Department Head review:

Valeria Riccardo 3/2/17
Department/Division Head Approval Date

Jim Graham 3/2/17
Head, Quality Assurance/Quality Control Date

Release/Effective date of this TCR:

Incorporate this TCR into next revision of this document? YES: X NO:

PPPL	PRINCETON PLASMA PHYSICS LABORATORY	PROCEDURE	No. ENG-010 Rev 6 page 1 of 11
	Subject: Control of Drawings, Software, and Firmware	Effective Date: Dec. 19, 2013	Initiated by: Head, Engineering Department
Supersedes: Rev. 5 dated August 23, 2011		Approved: Director	

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Management System (Primary): 03.00 ENGINEERING (ENG)
Management System Owner: Head, Engineering Department
Management Process: 03.04 Engineering Programs and Processes
Process Owner: Head, Engineering Department
Sub-Process: 03.04.07 Drafting and Drawing Control
Sub-Process Owner: Head, Mechanical Engineering
Subject Matter Experts: Head, Mechanical Engineering; Head, Mechanical Design; Cad Group Supervisor

APPLICABILITY

This procedure defines the process to follow to create, change, check, and use drawings at PPPL. Only approved, signed, stamped drawings shall be used for procurements and field work. This procedure delineates the steps and requirements necessary to produce these drawings and to make drawing changes.

This procedure also applies to software (including firmware and user-configurable hardware such as CPLD, FPGA, and ROM) maintained by PPPL that performs operational or process control or that monitors ES&H status.

This procedure does not address changes to requirements specifications. It is PPPL's policy that each Project, using a graded approach, develops and manages configuration control of requirements specifications. Such specifications may include project requirements, system requirements, and physics requirements documents.

This procedure also does not address changes to technical procedures which are addressed in ENG-030, PPPL Technical Procedures for Experimental Facilities.

INTRODUCTION

Laboratory activities that introduce change to engineering, facilities, and technical infrastructure and equipment often require the creation, preparation, alteration, and completion of drawings. This procedure uses the Engineering Change Notice (ECN) as the means by which the Cad Design Group may add new drawings or receives permission to change approved drawings. New drawings associated with new initiatives that have large quantities of drawings may also be added en masse by projects and numbered in accordance with approved procedures.

Software or firmware modifications or computer system level changes for systems whose failure could adversely impact experimental equipment operations, i.e. the NBI Programmable Logic

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Controller (PLC), use the Software Change Notice (SCN) to effect changes. The SCN provides a means of communicating, approving, limiting, and documenting change.

Both the ECN and the SCN can be generated as standalone documents or can be included as constituent documents in a Work Planning form per procedure ENG-032 per the discretion of the Responsible Line Manager (RLM). In conjunction with the Cad Design Group, the Work Planning Review Board Chair will monitor and evaluate the usage of ECNs by Cogs and RLMs for consistency and compliance with engineering procedures. The WPRB Chair will provide feedback to RLMs for continuous improvement of Engineering work planning systems.

An RLM approved ECN is required for all new drawings and for changes to existing drawings.

Any activity or issue that may challenge the Safety Manual, SAD, or Safety Certificate shall be considered an Unreviewed Safety Item (USI) and must follow Procedure ESH-025 to reach an Unreviewed Safety Item Determination (USID). Any actions pertaining to a USID shall be reviewed by the applicable ACC for recommendation prior to release of drawings, software, or firmware.

REFERENCES

ES-DRFT-001	PPPL Cad Manual
ENG-032	Work Planning Procedure
ENG-033	Design Verification
QA-005	Control of Non-conformances
ESH-025	Operations Hazard Classification Criteria and Safety Certification System

DEFINITIONS

Cognizant Individual (Cog)	The individual assigned responsibility for making a change (both the equipment configuration and the drawing which documents this configuration.) These individuals are identified by the RLM.
Cad Group	See General Requirements section of this document
Engineering Change Notice (ECN)	Form used to initiate, authorize, and describe changes to drawings.
Requesting Manager	The Cog's supervisor.
Responsible Line Manager (RLM)	See ENG-032 for definition
Sketch:	Prior to issuance of the drawing number, the generated picture is considered a sketch for presentation or information purposes only.
Unapproved Drawing:	When the picture has been placed on a lab drawing frame format and

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given a number, it is considered an unapproved drawing, which may be used at design reviews but may not be used for fabrication or installation or external use.

Approved Drawing: A drawing is considered approved when the Cog who has requested the drawing has reviewed, has checked or has had checked, has approved, and has signed the drawing, thereby verifying the drawing for content and correctness, and the Cad supervisor or designee has verified that the drawing complies with Cad standards.

Software Change Notice (SCN) Web-based form used to authorize and describe changes to software/firmware.

General Requirements for Drawings

The Cad Group issues drawing numbers for all new PPPL drawings, whether drawn by the Cad Group, the Cog, or other support personnel, and records the numbers in Drafting's records. In the instance of new project drawings, the project bears full responsibility for turning over all drawings and their numbering systems, whether electronic or hardcopy, to the Cad Group per PPPL policy at an appropriate point in the project lifecycle per the project RLM. Official PPPL drawings with PPPL drawing numbers are required for the manufacture of equipment or hardware incorporated into any experimental device or facility located on site at PPPL. It is incumbent on the RLM to assure, whether by discussion, spot checks of drawings, Peer Review of drawing packages, or other means per RLM discretion, that the drawings represent the design as vetted by any review processes that has occurred.

An unapproved drawing may be used for in-house fabrication with the approval of the cognizant engineer by signing the unapproved drawing. The fabricated part will be quarantined in the shop until the approved drawing is submitted to the shop.

PROCEDURE

This procedure is divided into four parts.

- Part A – New Drawings
- Part B – Drawing Changes
- Part C – Using drawing for installations or fabrications
- Part D – Transmitting Electronic Files of PPPL Approved Drawings
- Part E- ITER Related Drawings
- Part F – Software changes

A. New Drawings

The Cog is responsible for providing new drawings to the Cad Group. These drawings may be hand generated, generated via a computerized tool, or provided by a subcontractor or supplier.

The Cad Group is responsible for issuing new PPPL drawing numbers for all new drawings and for logging new drawings into Drafting files and records. The Cad Group is responsible to assure that all required approvals are provided for the drawing. New drawings may also be added en masse by projects and numbered in accordance with project specific approved procedures.

The steps for new drawings are:

<u>RESPONSIBILITY</u>	<u>ACTION</u>
Cog	1. Sketches the drawing, either on paper or via the computer.
Cog	2. Delivers the drawing and an RLM approved (Responsible Engineer concurrence as well for NSTX-U systems) ECN form to the Cad Group (paper media or computer media or both). TCR-ENG-010,R6-004
Cad Group	3. Assigns a number to the drawing.
Cad Group	4. Formalizes the drawing to PPPL drafting standards.
Cog	5. Assigns a checker to review the drawing for technical detail. (Note: The Checker may be the cognizant individual or appropriate designee)
Checker	6. Verifies the technical accuracy, dimensions, and tolerances of the drawing, and then forwards the checked drawing to drafting for updating.
Cad Group	7. The Cad Group makes the necessary modifications to the drawing based upon the input from the checker.
	8. Promotes the drawing in “Windchill” (data Management system) and forwards electronically to Checker and Cognizant Individual for approval.
Cog/Checker	9. Approves the drawing by electronically signing the drawing following drawing updates.
Cad Group	10. Verifies that the drawing is consistent and complies with PPPL Drafting Standards and indicates so by signing the drawing block
	11. Electronically Stamps original drawing - "Release for Fabrication"
	12. Posts the latest revision of completed drawing onto the “Project Engineering Drawing” web site located on PPPL home page.

B. Drawing Changes

The Cog is responsible for submitting an ECN form when changes to approved drawings are required. Minor field changes may be red-lined on the drawings and implemented when the Cog has determined that such changes are within the scope and context of all reviews that apply and that the

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changes do not invalidate associated calculations or analysis, do not change the scope of the design, and are indeed minor. The Cog is responsible to assure that these changes are submitted to the Cad Group on a new ECN or as additions to an existing ECN as soon as possible. Any changes to an ECN after the initial approval must be initialed and dated by the RLM.

The RLM is responsible for approving the ECN form to permit the Cad Group to make changes. The RLM is responsible for deciding if a completed Work Planning Form is required or desired prior to the implementation of an ECN per procedure ENG-032.

Changes to drawings for NSTX-U systems must have concurrence of the Responsible Engineer for the system. TCR-ENG-010,R6-004

Changes which the Cog and RLM do not feel should be incorporated into the original drawing shall be documented via a non-conformance report (NCR) per QA-005.

The Cad Group supervisor is responsible for issuing ECN numbers to the Cog, logging ECN numbers, assigning the ECN actions to Cad personnel, performing the ECN changes, obtaining drawing approvals, and closing out the ECN once all changes have been incorporated. Those drawings, which are pending changes via the ECN system, shall have an ECN with the ECN number placed on the original. This identifies to any individual that changes are pending on that drawing and that they should check with the drafting supervisor to see what changes are being planned for that drawing. Once the ECN changes have been completed, the revised drawing shall be entered into the Central CADD Files and drawing file with the ECN Pending sticker removed. The Cad Group Supervisor is responsible for adding any other drawing numbers to the ECN form which may be entailed as part of the change. These drawings shall have the same approvals as other drawings. Any ECN with drawings added after the initial approval, must be initialed and dated by the RLM. The Cad Group is responsible for assuring that drawings are updated upon the receipt of three (3) ECNs.

The Cad Group is responsible for posting the latest revision of PPPL engineering drawings on the "Project Engineering Drawing" web site located on the PPPL Home Page. This includes the ECN pending (with ECN stamp) drawings. Only the latest revisions of the PPPL engineering drawings are posted on the "Project Engineering Drawing" web site.

RESPONSIBILITY ACTION

- Cog
1. Completes pertinent information on the form. Information to be included on the ECN include:
 - The Cog's name
 - A title for the ECN appropriate for the technical nature of the work in progress.
 - The cost center, work package, and job number for the work. This is the charge number to be used by the Cad Group when incorporating the change.

The description to adequately document the change and its location, areas impacted, interfaces, and system impacts. Consult the system engineers if

impacts are not known.

- RLM
2. Enters the number of the associated Work Planning form. A Work Planning Form is required if the change:
 - is large or complex or represents a new installation into a usable space
 - has a significant ES&H impact
 - involves tritium or other radioactive contaminated or activated equipment
 - impacts multiple projects, systems, or groups OR
 - changes the scope or intent of the original design.

If a Work Planning form is not required per the decision of the RLM, the RLM must sign the ECN form indicating such.

Note: Even if the above specific triggering requirements do not precipitate the use of a Work Planning Form, the RLM can always use a Work Planning Form at any stage from conceptual design to final stages of project termination to manage work.

- Cog
3. Lists drawing numbers. Details of the drawing changes to be implemented by the Cad Group should be attached as sketches or marked up prints and the form so annotated.
- Cog/RLM
4. Signs the form prior to submittal to drafting.
- Cog
5. Consults Cad Group to obtain an ECN number.
- Cad Group
6. Issues the ECN number. This number opens a log record for the ECN which includes the name of the Cog to whom the ECN is assigned. Place an "ECN Sticker" on the drawing that needs to be revised. Manually generated drawings will use a hard ECN sticker. All Cad generated drawings will use an electronically placed ECN Pending sticker. These shall remain on the drawing until changes have been completed.
 7. Posts the ECN pending drawing with stamp onto the "Project Engineering Drawing" web site located on PPPL home page.
- Cad Group
8. The ECN Log Record will be updated by the Cad Group Supervisor to reflect the status of the ECN's on a weekly basis. The ECN Log is Available on the Mechanical Engineering web site.
 9. Makes the necessary changes. Drafting shall add drawing numbers to the ECN if it becomes clear that additional drawings are impacted by the change.

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| Cog/RLM | <p>10. The Cog must approve these drawing changes and obtain the RLM’s initials for any additional drawings added to the approved ECN. For changes to a NSTX-U drawing, the Responsible Engineer must also sign the ECN. TCR-ENG-010,R6-004</p> <p>11. Processes the drawing per steps A.5 – A.7.</p> <p>12. Closes the ECN number when all changes have been incorporated into the drawings.</p> |
| Cad Group | <p>13. Posts revised drawing onto the “Project Engineering Drawing” web site.</p> |

C. Using drawings for installations, procurements or fabrications

"This procedure requires that a) only prints or PDF’s of approved drawings can be stamped "Approved for fabrication" and b) only drawings stamped "Approved for fabrication" can be used for installation, procurement or fabrication, whether at PPPL or a supplier's facility. Note the exception in the “General Requirements Section” whereby the manufacturing of parts in PPPL shops may be started with unapproved drawings. PPPL drawings shall have the PPPL stamp. Collaborator supplied drawings require an approved stamp by their organization. Vendor drawings should have either a vendor stamp with equivalent wording or, in the case where a vendor stamp is not forthcoming; the RLM or Cognizant individual can initial the prints of approved drawings as “Approved for fabrication or installation.”

Approved drawings are required when:

- used for procurements or subcontracts (as required by the PPPL Procurement Manual),
- for in-house fabrication except where exempted by the RLM with the concurrence of the FOM Division Head, or
- As required by the associated Work Planning form (ENG-032).

Otherwise, the drawing requirements are at the discretion of the RLM." The Cad Group supervisor electronically initials and dates the stamp. There are no PPPL requirements for an expiration date on drawings; therefore "N/A" shall be placed in the expiration date space.

<u>RESPONSIBILITY</u>	<u>ACTION</u>
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|------------------------|---|
| Responsible Individual | 1. Requests a drawing from Drafting. |
| Cad Group | <p>2. Assures that drawing is approved.</p> <p>3. Applies “Approved for fabrication.” Stamp on electronic PDF version of drawing.</p> |

- | | |
|-------------|---|
| Cad Group | <p>Note: A "Release for Fabrication" stamp must be placed on the files which are sent to the outside manufacturer. The file size and date shall also be added to the label. This would allow PPPL QC and Engineering to verify the date and revision of the files being used by the manufacturer. A print out identifying the drawings with revision will also be provided to the vendor through procurement.</p> <p>4. Transmits electronic file to PPPL Procurement agent for issuance to outside party or manufacturer.</p> |
| Procurement | <p>5. Provides updated drawings to the manufacturer or assembler with guidance from Cognizant individual, if changes occur prior to completion of the order. These drawings shall also be stamped "Release for Fabrication".</p> |

D. Transmitting Electronic Files of PPPL Approved drawings

The Cad Group is responsible for transmitting all electronic files of approved PPPL drawings to the assigned procurement agent for issuance to outside party or manufacturer for fabrication purposes. This is to ensure that the electronic file is current and that there are no outstanding ECN's on the drawing.

RESPONSIBILITY ACTION

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| Responsible Individual | 1. Makes request to Cad Group to transmit an electronic file of a PPPL drawing outside of the laboratory and sends a copy of the request to procurement |
| Cad Group | <p>2. Assures that electronic file is current with no outstanding ECN's</p> <p>3. Electronically applies "Approved for Fabrication" on PDF of drawing.</p> <p>4. Transmits electronic file to assigned PPPL Procurement agent for issuance to outside party or manufacturer.</p> |
| Procurement | 5. Issues stamped drawings to outside party or contractor. |

E. ITER Related Drawings

Drawings that are related to the ITER project are created using CATIA CAD-software. Presently these drawings follow PPPL procedures as outlined in ENG-010, however the US ITER headquarters

is presently generating a new Cad policy and procedure that will be followed in the future for ITER drawings. Once these procedures are approved they will be reflected in a revision to ENG-010.

F. Software Changes

The Responsible Line Manager is responsible for determining which specific software is considered to be critical, and for providing this information to the Controls and Data Acquisition (CODAQ) division, within the Information Technology (IT) department. Critical refers to software whose failure could adversely impact operations. The RLM is also responsible for approving changes to this software.

CODAQ is responsible for maintaining a website for using and administering the SCN processes. This includes the RLM-requested list of software that are deemed to be critical and operational for which changes should be controlled via the SCN. CODAQ will conduct an annual review with RLMs to incorporate additions to this list. CODAQ is also responsible for tracking open SCNs.

The Cognizant individual responsible for implementing changes in critical and operational software is responsible to generate a Software Change Notice to document the change. This individual is also responsible for the scheduling of the change to assure that the timing of the change is compatible with operations and to assure that back out from the change can be performed, if necessary.

RESPONSIBILITY

ACTION

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|--------------------|---|
| Cog or RLM | 1. <i>Perform this step only when the software to be changed is not already identified, i.e., shown on the <u>Current Critical Software List</u> at http://scn.pppl.gov/criticalscn.asp and meets the definition of critical. Advise CODAQ (SCN administrator) that a new software package needs to be added to the online <u>Critical Software List</u>. The required information is listed on Attachment 2.</i> |
| Cog | 2. <i>Fills out a <u>Software Change Notice</u> using the web form (http://scn.pppl.gov/). See Attachment 3. The SCN website will notify the Requesting Manager via e-mail that a new SCN has been submitted for review and is awaiting their disposition.</i> |
| CODAQ | 3. <i>The SCN website issues numbers and maintains an SCN log.</i> |
| Requesting Manager | 4. <i>Using the SCN website, the Requesting Manager approves/denies the cog's defined scope and desired results. The SCN website will notify the RLM via e-mail that a new SCN has been submitted for review and is awaiting their disposition.</i> |
| RLM | 5. <i>Using the SCN website, the RLM approves/denies the SCN.</i> |

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- Cog
 - 6. After RLM’s approval to proceed, the Cog. may implement the change to software.
 - 7. Using the SCN website, Cog records the actual date of implementation and closes out SCN.
- CODAQ
 - 8. The SCN process is complete. The SCN website maintains records in it back-end database.

G. Training

- Head, Mechanical Design
 - 1. Specifies the appropriate training methods and means (below) and obtains concurrence of the Management System Owner and the Management Process Owner.
 - a. Target Audience:** Cognizant Individuals, IT Department, Engineering Department Staff
 - Instructor:** Head, Engineering Department
 - Training Method:** Read only
 Email distribution
 - Frequency:** Once Only, upon every revision of this procedure
 - b. Target Audience:** Cad Group
 - Instructor:** Head, Mechanical Design
 - Training Method:** Training Briefing
 - Frequency:** Once Only, upon every revision of this procedure

H. Records Requirements Specific To This Procedure

Records Custodians must assure records are maintained as follows:

Record Title	Record Custodian	Location	Retention Time
Engineering Change Notice Form	Cad Group Supervisor	Mechanical Engineering Web Site	Admin 20 (2.b) Delete when data have been entered into master file or database and verified, or when no longer required to support reconstruction of, or serve as back-up to a Master file or database, whichever is later
Software Change Notice Form	SCN Administrator	SCN Web Site	Admin 20 (2.b) Delete when data have been entered into master file or database and verified, or when no longer required to support reconstruction of, or serve as back-up to a Master file or database, whichever is later
Engineering Drawing	Cad Group Records Coordinator	Project Engineering Drawing Web Site	Admin 17 Various depending on type of drawing
ECN Log	Cad Group Supervisor	Mechanical Engineering Web Site	Admin 20 (4) Delete when the agency determines that they are no longer needed for administrative, legal, audit, or other operational purposes.
Current Critical Software List	SCN Administrator	SCN Web Site	Admin 20 (4) Delete when the agency determines that they are no longer needed for administrative, legal, audit, or other operational purposes.
SCN Log	SCN Administrator	SCN Web Site	Admin 20 (4) Delete when the agency determines that they are no longer needed for administrative, legal, audit, or other operational purposes.

ATTACHMENTS:

1. Engineering Change Notice Form
2. Information the Cog or RLM must provide to CODAQ for *new* Critical Software
3. Software Change Notice (SCN) web form - typical

Engineering Change Notice Form (ECN)

Attachment 1

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PPPL ENGINEERING CHANGE NOTICE (ECN) ECN # _____

COGNIZANT INDIVIDUAL:**ECN TITLE:****CC/WP/Job:** **AREA OR PROJECT:**

LIMITATION OF SCOPE - NOTE: A Work Planning Form is NOT required if the total change to be accomplished (ENG-032):

- Is not large or complex or does not represent a new installation into a usable space
- Does not have a significant ES&H impact or USID/USI pending
- Does not have a significant ES&H impact
- Does not involve tritium or other radioactive contaminated or activated equipment
- Does not impact multiple projects, systems, or groups
- Or does not change the scope or intent of the original design.

Responsible Line Manager CONCURRENCE: _____

(Signature indicates that no Work Planning form is required.)

If non-concurrence or associated with a work planning form, enter the WP number: _____

DRAWING(S) AFFECTED NUMBER:	Current Revision	TITLE

Continued on back.

DESCRIPTION OF CHANGE: (state drawing no., zone, group, or list attachments)

REASON FOR CHANGE:

ENGINEERING CHANGE NOTICE APPROVALS :**DATE:**

COGNIZANT INDIVIDUAL MAKING CHANGE:

RESPONSIBLE ENGINEER CONCURRENCE:

(Only needed for NSTX-U) TCR-ENG-010,R6-004

RESPONSIBLE LINE MANAGER:

**Information the Cog or RLM must provide to CODAQ for new
Critical Software****Attachment 2**

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For *new* Critical Software, the RLM (or Cog) must supply the following information to CODAQ. The SCN administrator will add the software to the *Critical Software List* web page which can be seen at <http://scn.pppl.gov/criticalscn.asp> .

- Name of new *critical software* package.
- Cog (principle) engineer.
- Requesting Manager.
- RLM.
- Individuals to notify whenever this software is changed. Note that others can be added by the cog when the SCN web form is filled out.

Typical "Add new SCN" form.

Add New SCN Record - Google Chrome

scn.pppl.gov/addscn.asp

PPPL Software Change Notice Form

COG Engineer : Sichta, Paul Date : 6/11/2013 SCN # _____
 Project : NSTX Critical Software : NSTX TRECAMS

Current Backup Type: CogStandAlone or New Backup Type : _____
 Current SoftwareVersion : D/3 V10 or New Version : _____

Limitation of Scope (Note): A Work Planning Form (ENG-032) is NOT required if the total change to be accomplished:

- Is not large or complex or does not represent a new installation into a new space.
- Does not involve nuclear boundary, tritium contaminated equipment, or activated equipment
- Does not impact multiple projects, systems or groups.
- Does not have a significant ES&H impact.
- Does not alter the original intent or scope of the original design.

Responsible Line Manger Concurrence: Von Halle, Al
 (Signature indicates that no Work Planning form is required)

If non-concurrence or associated with a work planning form, enter the WP number: _____

General Description of Change:

Reason for Change, Desired Results, Required Testing:

List Programs, files and/or Computers affected :

Individual(s) to notify that change has been implemented:
 cgentile@pppl.gov psichta@pppl.gov rcamp@pppl.gov
 _____@pppl.gov _____@pppl.gov _____@pppl.gov

Cognizant individual requesting Change : (same as above)
 Requesting Manager : Sichta, Paul
 Responsible Line Manager approving change: Von Halle, Al

Date Change implemented : _____ by : _____