Office of Inspector General

Review of RBOPS' Oversight of the Next Generation $100 Note

Board of Governors of the Federal Reserve System

January 2012

BOARD OF GOVERNORS
OF THE
FEDERAL RESERVE SYSTEM
WASHINGTON, D. C. 20551

OFFICE OF INSPECTOR GENERAL

January 27, 2012

Ms. Louise L. Roseman, Director
Division of Reserve Bank Operations and Payment Systems
Board of Governors of the Federal Reserve System
Washington, DC 20551

Dear Ms. Roseman:

The Office of Inspector General (OIG) of the Board of Governors of the Federal Reserve System (Board) is pleased to present its report on the *Review of RBOPS' Oversight of the Next Generation $100 Note.* The Board is the sole issuer of U.S. currency and is responsible for the quality of Federal Reserve notes. The next generation (NXG) currency redesign project, which began in 2000, resulted in new designs for the $5, $10, $20, and $50 notes between 2003 and 2008. The NXG $100 note is the final denomination to be redesigned and includes the most complex anti-counterfeiting security features ever incorporated into U.S. currency.

Product development for the NXG $100 note began in 2006, and the Department of the Treasury's Bureau of Engraving and Printing (BEP) started production at its two facilities in January 2010. In July 2010, the BEP observed a rapid increase in the frequency of NXG $100 note currency paper creasing during the printing process. The rate of creasing continued to grow, and in September 2010, production was stopped at one BEP facility. The second BEP facility continued to print a reduced number of NXG $100 notes to be used in tests to identify the cause of the problem. Since there was no readily apparent resolution of the creasing problem, the Board issued a press release on October 1, 2010, announcing a delay in the issuance date of the redesigned NXG $100 note. Over 1.4 billion NXG $100 notes are in various stages of completion.

Our review objectives were to (1) assess the Division of Reserve Bank Operations and Payments Systems' (RBOPS') oversight of the design and production of the NXG $100 notes; (2) review the actions RBOPS is taking to address the current printing problems (including the contract for an independent technical review) and to enhance controls to minimize the likelihood of future printing problems; and (3) assess plans for the disposition of NXG $100 notes that have already been printed.

Our analysis determined that actions taken by RBOPS appropriately addressed the identified printing issues and enhanced controls to minimize the likelihood of future printing problems. In addition, we determined that RBOPS staff is participating in the assessment of plans for the disposition of the more than 1.4 billion NXG $100 notes. We identified three areas,

however, where RBOPS oversight of the Federal Reserve note design and quality control production process could be strengthened:

- RBOPS staff should comply with requirements in a Memorandum of Understanding (MOU) that details the authorities, responsibilities, and understandings between RBOPS and the BEP, to include agreeing on a limited initial production quantity of newly designed currency;

- The Interagency Currency Design (ICD) workgroup, which provides technical guidance on currency design and other subjects that affect U.S. currency, should operate under an executed charter; and

- The current MOU between the Board and the BEP should be updated and expanded to incorporate the increased complexity of note design, quality control, and production.

Our report contains recommendations to address the absence of (1) an approved and signed ICD charter and (2) an updated MOU. We did not make a recommendation regarding compliance with requirements in the MOU because, as discussed in our report, the Board and the BEP agreed in September 2011 on a limited initial production quantity as part of an NXG $100 note production validation agreement. The purpose of this agreement is to ensure that all technical problems are identified and resolved prior to restarting full production of the NXG $100 note.

We provided you with a copy of our report for review and comment. In your response, included as Appendix 2, you agreed with our recommendations and discussed actions that have been or will be taken to implement them.

We appreciate the cooperation that we received from RBOPS staff during our review. The principal OIG contributors to this report are listed in Appendix 3. The report will be added to our public web site and will be summarized in our next semiannual report to Congress. Please contact me if you would like to discuss the report or any related issues.

Sincerely,

Anthony J. Castaldo
Associate Inspector General
for Inspections and Evaluations

cc: Vice Chair Janet L. Yellen
Governor Elizabeth A. Duke
Jeffrey C. Marquardt

Office of Inspector General

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Background

The design, production, and issuance of U.S. currency—Federal Reserve notes—involve several federal agencies whose responsibilities and authorities are determined separately by statutes and regulations. The Board of Governors of the Federal Reserve System (Board) is the sole issuer of U.S. currency and is responsible for the quality of the Federal Reserve notes. The Department of the Treasury's Bureau of Engraving and Printing (BEP) designs the notes in collaboration with the Board, the Federal Reserve Banks' Currency Technology Office (CTO), and the U.S. Secret Service (USSS).[1] The BEP tests new currency designs and prints notes at two production facilities—the Eastern Currency Facility (ECF) in Washington, DC, and the Western Currency Facility (WCF) in Fort Worth, Texas. Armored carriers deliver packaged notes from the BEP facilities to Federal Reserve Banks at the direction of the Board's Division of Reserve Bank Operations and Payment Systems (RBOPS).[2] The Federal Reserve Banks then distribute the notes to commercial banks for general circulation.

As shown in the timeline included in Appendix 1, the next generation (NXG) currency redesign project began in 2000. In 2002, the Board and the BEP announced plans to issue several denominations of newly designed Federal Reserve notes. The NXG project initially included the $20, $50, and $100 notes and later added the $10 and $5 notes. The NXG $20 note was issued in 2003, followed by the $50 note in 2004, the $10 note in 2006, and the $5 note in 2008. The NXG $100 note is the final note to be redesigned under this project.

Product development for the new design began in 2006. As shown in figure 1 on the next page, the NXG $100 note design includes the most complex anti-counterfeiting security features ever incorporated into a Federal Reserve note. The note's advanced security features include (1) a blue, three-dimensional (3-D) security ribbon woven into the paper that contains images of bells and 100s that change from the one image to the other as the note is tilted, and (2) an image of a color-shifting bell, inside a copper-colored inkwell, that changes color from copper to green when the note is tilted. Despite the security enhancements, the new design for the $100 note retains the traditional look of U.S. currency.

[1] The CTO operates under the Cash Product Office (CPO). It implements and maintains the systems and infrastructure for high-speed automated authentication fitness assessment and the destruction of unfit notes.

[2] RBOPS is a division within the Board that has responsibility for ordering and issuing Federal Reserve notes. The Deputy Director responsible for the division's Banknote Planning and Quality Control and Banknote Issuance and Cash Operations is the Board's representative on a multi-agency steering committee that provides guidance on U.S. currency issues, including new designs.

Figure 1: Next Generation $100 Note

Production of the NXG $100 note was delayed on multiple occasions due to the complexity of the design, to include problems associated with the 3-D security ribbon. The initial March 2008 production start date was first rescheduled for late 2009, but continued problems resulted in production not beginning until January 2010. On April 21, 2010, approximately three months after production started, representatives from the Board, the Department of the Treasury, and the USSS publicly unveiled the NXG $100 note and announced that circulation would begin in February 2011. In July 2010, three months following the unveiling event, the BEP's WCF experienced a rapid increase in the frequency of NXG $100 note currency paper creasing during the printing process.

During the NXG $100 note's product development trials that took place between 2006 and 2009, paper creasing occurred occasionally and was handled in accordance with the BEP's standard operating practices. Occasional creasing is considered normal during product development and/or production. Creasing defects range from those that are easily identified by an area of the note that is missing ink, to ones that require detection by a trained eye and/or magnification.

In response to the escalating paper creasing incidents observed in July 2010, the BEP (1) immediately arranged for the currency paper supplier to observe the problem first-hand; (2) informed the Board; and (3) documented the creasing problem in weekly and monthly reports to the Department of the Treasury. In September 2010, the continued increase in the rate of creasing prompted the WCF to stop production of the NXG $100 note. The ECF continued to print a reduced number of NXG $100 notes to be used in tests to identify the cause of the problem. Since there was no readily apparent resolution of the creasing problem, the Board issued a press release on October 1, 2010, announcing a delay in the issuance date of the redesigned NXG $100 note. Over 1.4 billion NXG $100 notes are in various stages of completion; however, the actual number of creased notes is unknown. Approximately 1.1 billion notes have been printed and packaged, approximately 166 million notes that do not meet quality standards have been set aside, and approximately 200 million notes are at different stages of production.

The BEP and the paper supplier conducted extensive research that included analyzing production data and performing printing trials. However, these efforts did not identify the root cause of the creasing problem or predict the likelihood of recurrence. As a result, in February 2011, the

Board expanded an existing management consulting firm contract for improving overall quality practices at the BEP, to include evaluation of the NXG $100 note creasing issue.

Objective, Scope, and Methodology

The Board's Office of Inspector General (OIG) and the Department of the Treasury OIG conducted concurrent reviews of the problems experienced in printing the NXG $100 notes. The Board OIG's objectives were to

- assess RBOPS's oversight of the design and production of the NXG $100 notes;
- review the actions RBOPS is taking to (a) address the current printing problems, including the contract for an independent technical review, and (b) enhance controls to minimize the likelihood of future printing problems; and
- assess plans for the disposition of NXG $100 notes that have already been printed.

To accomplish these objectives, we interviewed staff from the Board, the BEP, and the above mentioned management consulting firm. We reviewed records and reports that included memoranda of understanding (MOUs) between the Board and the BEP, interagency committee charters, meeting minutes, BEP status reports, and the consulting firm's interim reports. We conducted our fieldwork from March 2011 through October 2011 in accordance with the *Quality Standards for Inspection and Evaluation* issued by the Council of the Inspectors General on Integrity and Efficiency.

Results

Objective 1: Assess RBOPS's oversight of the design and production of the NXG $100 notes

As described earlier, the Board is the sole issuer of Federal Reserve notes, and RBOPS (on behalf of the Board) is responsible for ensuring the high quality of the notes printed by the BEP.[3] To fulfill this responsibility, RBOPS participates on a high-level multi-agency committee (the Advanced Counterfeit Deterrence (ACD) Steering Committee) that (1) provides recommendations on currency redesign to the Secretary of the Treasury, and (2) appoints or approves all interagency working groups and monitors their progress. The ACD Steering Committee is chaired by the U.S. Treasury Under Secretary for Domestic Finance, or his/her designee, and includes the Treasurer of the United States; the Director of the BEP; the Board's Deputy Director of Financial Services, or his/her designee; the Reserve Banks' CPO Director, or his/her designee; and the Deputy Assistant Director, Office of Investigations, USSS, or his/her designee.

[3] The Federal Reserve Act sets out the responsibilities of the Federal Reserve related to Federal Reserve note issuance, destruction, and liability.

The ACD Steering Committee established the Interagency Currency Design (ICD) workgroup that, according to November 2008 steering committee minutes, was to provide technical guidance to the ACD Steering Committee on currency design and other subjects that affect U.S. currency. The ICD workgroup consists of representatives from the Board, the BEP, the USSS, and the CTO. The ICD workgroup is chaired by a BEP representative; meets nearly every month; and discusses a wide range of topics, such as technical issues with the production of the NXG $100 note, counterfeit statistics, and ways the new design can help the visually impaired. Despite the important functions this group performs, the ICD workgroup operates under a charter that has not been signed or approved by the ACD Steering Committee. The ICD charter is one of two key documents that provides technical guidance and establishes basic responsibilities for the Board, with the second document being an MOU between the Board and the BEP.

Prior to 1998, there was no formal written agreement that stated the authorities, responsibilities, and understandings between the BEP and the Board to authorize the printing and shipping of Federal Reserve notes, including responsibilities for the quality of new currency design, security, maintenance of inventory, and procedures for the destruction of unfit currency.[4] An MOU was established between the Board and the BEP in 1998 in response to problems that occurred during printing of newly designed $50 notes in 1997. The Government Accountability Office (GAO) had reviewed this issue and provided testimony in late 1997, "Printing of Flawed Redesigned $50 Notes," that recommended that the Secretary of the Treasury and the Board

1) Formalize an agreement to have the Board, the USSS, the BEP, and other relevant Treasury officials involved early in the currency production process for future redesigned notes to inspect production and agree on an acceptable level of quality;

2) Limit initial production of newly designed currency to the number that would be necessary to provide reasonable assurance that all production problems are resolved, and include such a limitation in their written agreement; and

3) Explore the feasibility of design changes that might lessen the potential for production problems for future redesigned denominations.

One of the provisions of the 1998 MOU called for the Board and the BEP to mutually agree upon a limited initial production quantity of newly designed currency to ensure that all technical problems were resolved prior to full production.

Objective 2: Review the actions RBOPS is taking to (a) address the current printing problems, including the contract for an independent technical review, and (b) enhance controls to minimize the likelihood of future printing problems

The Board has taken steps to address the current creasing problem and enhance controls in future printing. An initiative began in December 2009 to improve the overall quality of notes produced at the BEP. This initiative included hiring management consultants in October 2010 to recommend improvements for the overall quality control of note production at the BEP. The

[4] A previous MOU from 1981 between the Board and the BEP only addressed the basic authority, responsibilities, and understandings regarding the supply of U.S. currency.

Board recognized the need to review the quality control practices at the BEP for several reasons. First, processes for printing Federal Reserve notes have become increasingly more complex over time, driven largely by the need to deter counterfeiting. Second, the Board has become more involved in note design, testing, and production to meet its responsibilities to ensure the quality of notes in circulation.[5] Third, going forward, the BEP will implement new quality control practices for printing other denominations, and the Board will participate in setting and approving the quality standards.

In October 2010, the Board contracted with management consultants to

- improve the consistency of high-quality notes delivered from the BEP to the Board,
- ensure the security of and reduce the functional failures of notes in circulation, and
- optimize the cost effectiveness of Federal Reserve note production by reducing spoilage and eliminating costs associated with errors in raw material and production.

In February 2011, the Board expanded the scope of this contract to incorporate an independent review of the NXG $100 note creasing problem to provide a level of confidence that creasing would not recur, after the BEP and the paper manufacturer were unable to identify the root cause. In April 2011, the consultants provided an interim report with recommendations addressing the creasing issue.

After more than five months of testing that resulted in the BEP and the paper manufacturer modifying their production process to incorporate the consultants' recommendations, Board officials indicated that the creasing problem had been mitigated to negligible levels. As part of the ongoing effort to understand the cause of the creasing, Board staff made several on-site visits to the BEP and the paper manufacturing company. To enhance controls and minimize the likelihood of future printing problems during NXG $100 note production, the BEP, with assistance from the consultants, drafted a detailed production validation test plan.[6]

In August 2011, the Board, the BEP, the paper manufacturer, and the management consultants agreed on a production validation strategy featuring a continued uninterrupted production schedule. To formalize this agreement, the Board and the BEP signed a *Mutual Agreement for Production Validation* document in September 2011. Both organizations agreed to a "production validation protocol and the related volume of notes and quality criteria." The validation process would examine raw material improvements, printing press modifications, and a crease detection system to ensure that all processes are sufficiently robust to sustain long-term production with a manageably low level of creasing. The initial production validation would consist of printing 81

[5] RBOPS reorganized the section responsible for cash and currency into two business areas, the Banknote Planning and Quality Control section and the Banknote Issuance and Cash Operations section, to better address currency production issues and the Reserve Bank oversight responsibilities.

[6] The objectives of this production validation are to (1) validate that the resolution to the NXG $100 note creasing issue was sufficiently robust to sustain long-term production with a manageably low level of creasing and (2) gain confidence that production is ready for routine full-scale production with the ability to sustain annual demand.

loads of paper over a 3-week period.[7] Production validation began in September 2011 at the WCF and is anticipated to start at the ECF in March 2012.

Objective 3: Assess plans for the disposition of NXG $100 notes that have already been printed

As of July 2011, there are approximately 1.4 billion NXG $100 notes stored in the ECF and the WCF, including packaged individual notes ready for shipment to the Federal Reserve Banks and sheets of notes that are in various stages of completion. The BEP's current printing process includes a step to inspect sheets of printed Federal Reserve notes prior to them being cut into individual notes; there is presently no efficient method to inspect and detect creasing on already cut individual notes. In order to inspect individual notes, a new system for single note inspection (SNI) must be developed.

In July 2011, the BEP conducted a cost-benefit analysis to assess alternatives for the disposition of the printed NXG $100 notes. The BEP's analysis determined that the cost to reclaim notes of an acceptable quality through an SNI system would be less than the replacement cost.[8] The BEP presented two options to the Board for processing the notes through SNI systems. One option is for the BEP to procure the SNI systems and process the notes at both BEP facilities. The other option is for the Board to procure the SNI systems and process the cut notes at two Federal Reserve Banks. As of August 11, 2011, Board staff indicated that there is no significant cost savings associated with processing the notes at the Federal Reserve Banks. Board staff also noted that certain costs were not included as part of the cost-benefit analysis and stated that it makes better business sense to process the notes at the BEP, since SNI systems will likely be incorporated into the BEP note inspection process going forward, which will require the BEP to have the machines set up in its facilities.[9]

The BEP started the process to procure SNI systems, and Board staff stated that the sensor capability of these systems will need to be clearly understood for the Board to establish acceptable quality standards. Implementation of these standards will result in the delivery of high quality notes and reduce waste as much as possible. Officials also commented that resolving the creasing issue and returning to production takes priority over plans for the disposition of the NXG $100 notes.

Findings and Recommendations

We believe that actions the Board has taken appropriately addressed the identified printing problems and enhanced controls to minimize the likelihood of future printing problems. In addition, we determined that Board staff is participating in the assessment of plans for the disposition of the 1.4 billion NXG $100 notes. We identified three areas however, where the

[7] An NXG $100 note load is 16,000 sheets of paper; each sheet contains 32 notes.

[8] The replacement cost would include the cost of destroying all of the NXG notes in the inventory and printing new notes.

[9] BEP expects to continue to use the SNI systems and reclaim currency of other denominations after all NXG $100 notes are processed.

Board's oversight of the Federal Reserve note design and quality control production process could be strengthened:

- Board staff should comply with requirements in the MOU, in coordination with the BEP;
- The ICD workgroup should operate under a charter signed by the ACD Steering Committee; and
- The current MOU between the Board and the BEP should be updated and expanded to incorporate the increased complexity of note design, quality control, and production.

Although the Product Quality section of the 1998 MOU required the Board and the BEP to agree on a "limited initial production quantity of newly designed currency" to ensure that "all technical problems are identified and resolved prior to [starting] full production," there was no evidence that such an agreement was reached for printing the NXG $100 note, nor was production validation performed to resolve all problems. Our analysis of the ICD workgroup meeting minutes, the BEP status reports, ACD Steering Committee minutes, and interviews revealed that excess paper or paper fiber—referred to as "trash"—resulted in defective notes during preproduction as early as October 2009 and was identified as a significant problem.[10] The problem with trash was not corrected, however, and continued into full production, resulting in several work stoppages in February and April 2010.

Interviews with Board staff and BEP senior officials revealed that an agreement or consensus was not established for the NXG $100 note to define what constituted a "limited initial production quantity of newly designed currency." When questioned about an agreed-upon initial quantity, senior officials and staff provided a variety of responses that included (1) not knowing what that quantity was, (2) quantities were consistent with prior practices, (3) preproduction testing had been done at every level as features were added or removed, and (4) the agreed amount was between 40 and 60 loads.

The 1997 GAO testimony included a recommendation that the Board, the USSS, the BEP, and other Treasury officials inspect the quality of note production earlier in the production process. In 1997, the Board did not inspect production run notes until approximately 200 million $50 notes had been printed. As a result, the GAO testimony recommended that the Secretary of the Treasury and the Board limit initial production of newly designed currency to the number that would be necessary to provide reasonable assurance that all production problems are resolved and include such a limitation in their written agreement. Despite the events in 1997, in early 2010, two months after full production of the NXG $100 note began, Board representatives noticed a quality issue with the new notes during a visit to the BEP, and production was temporarily stopped after over 166 million notes had been printed.

We believe that starting full production without an agreed-upon limited initial production quantity and ensuring that all preproduction problems were identified and resolved was inconsistent with the principles set forth in the 1998 MOU. We are not making a

[10] Trash is excess paper or paper fiber that attaches to rollers during the printing process, resulting in the printing of unacceptable notes.

recommendation regarding this issue because, as discussed earlier in our report, the Board and the BEP agreed in September 2011 on a limited initial production quantity to perform the NXG $100 note production validation for the restart of production. In addition, the new-signed production validation agreement is intended to ensure that all technical problems are identified and resolved prior to restarting full production of the NXG $100 note. However, below are two recommendations regarding the absence of an approved and signed ICD charter and an updated MOU.

1. **We recommend that the Deputy Director of RBOPS continue working with other ACD Steering Committee members to approve an ICD charter.**

ICD members have been participating in this workgroup for several years without a final, approved charter. The draft ICD charter defines the roles and responsibilities between the Board, the BEP, the USSS, and the CTO, as it relates to note design and counterfeit deterrence. One function of the ICD workgroup is to provide technical assistance and guidance to the design process and ensure the proposed designs can be authenticated and are able to be used on all Federal Reserve System equipment. The group also evaluates and recommends security features for currency designs and provides advice on technical and design issues that may affect the integrity of Federal Reserve notes. In addition, the ICD workgroup apprises and makes recommendations to the ACD Steering Committee of any issues affecting changes in the design of the note.

Regarding discussions concerning ways to improve the charter, a May 2008 document indicated that the workgroup's members showed a general frustration with the operation of the ICD. Issues discussed included that the ICD workgroup was not functioning as well as desired and that there was uncertainty about what issues should be elevated to the ACD Steering Committee and how the ACD Steering Committee wants information forwarded from the ICD workgroup. ACD Steering Committee minutes from November 2009 supported the notion that the ICD workgroup was not functioning as expected. Over the course of that year, the ICD workgroup revised the draft charter and sent it to the ACD Steering Committee for review and approval. However, the draft has not been approved or signed. We believe that having an approved charter will provide the clarity necessary to address frustrations and would foster a more effective and productive ICD workgroup.

2. **We recommend that the Director of RBOPS work with the BEP to update their MOU and ensure that the language and content of the ICD charter and the MOU are consistent.**

The 1998 MOU between the Board and the BEP describes certain authorities, responsibilities, and agreements between the Board and the BEP to authorize the printing and shipping of Federal Reserve notes. In addition, it prescribes procedures for the destruction of unfit currency and charges to the Board for operations relating to the production and retirement of Federal Reserve notes by the BEP. The 1998 MOU is outdated, incomplete, and vague.

For example, the MOU contains references to several agency offices, such as the Reserve Banks' *Cash Fiscal Product Office* and BEP's *Securities Technology Institute*, that no longer exist. The

functions that these offices were performing are currently being executed by the ICD workgroup and the Reserve Banks' CPO.

In addition, the MOU is incomplete with respect to timely notification of quality control problems. Specifically, the MOU does not have a notification timeframe when problems must be disclosed to the other agency when either the Board or the BEP discovers that a product does not conform to acceptable quality levels. We believe that an extended delay in notification may result in unnecessary additional costs being incurred if appropriate measures to quickly resolve or to prevent recurrence of the problem are not taken.

Furthermore, as discussed earlier, during our interviews with several senior staff, we discovered that there was no clear consensus on what constituted a "limited initial production quantity of newly designed currency." We believe this confusion stemmed from the MOU's incomplete and vague language. The MOU also does not address specific topics that are critical to the development of a new currency design, such as project plan development, project management, and new design change control.

As the design, development, production, and product quality processes for Federal Reserve notes have become more complex over time, these processes should have become more collaborative between the two agencies. While the Board and the BEP have begun to update the MOU, they have not finalized the document and have yet to reach consensus on updated roles and responsibilities between the agencies for the design and development processes. Without a clear and updated MOU, we believe that confusion over the roles and responsibilities between the Board and the BEP will continue and that problems encountered during the redesign of the NXG $100 note could surface again during future redesigns.

Analysis of Comments

We provided a copy of our report to the Director of RBOPS for review and comment. In her response, included as Appendix 2 to this report, the Director noted that the Board and the BEP did not establish a limited initial production quantity before full production as required by the MOU but that even if a limited initial production quantity had been established, the creasing problem would not have been identified. Systemic creasing did not occur until after a large quantity of notes had been produced, and the initial quantity would have been far below this level. With respect to recommendation 1, the Director agreed to work with members of the ACD Steering Committee to finalize the ICD charter. With respect to recommendation 2, the Director noted that an MOU between the Board and the BEP was finalized and signed on December 22, 2011, which was while the formal draft of our report was out for comment.

Appendixes

Appendix 1 – Timeline

Date	Event
2000	NXG redesign project initiated.
2002	The BEP and the Board announced plans to release the next generation of redesigned notes. NXG project originated for $20s, $50s, and $100s. Redesigns for the $10s and $5s were still under consideration.
2006	Product development for the NXG $100 note started.
2007	Production of the NXG $100 note was originally scheduled for March 2008; and unveiling was scheduled for April 2008, with issuance to the public in October 2008. Because of issues identified with the paper, the unveiling date was moved to October 2008.
2008	The paper manufacturer continued to have challenges due to the complexity of the design and quality requirements of the 3-D security ribbon.
Feb 2009	The new target for unveiling the NXG $100 note was September 2009.
Sep 2009	The BEP expected to transition into production in November 2009 at ECF and December 2009 at WCF.
Oct 2009	ICD workgroup meeting minutes noted the decision made by the BEP to remove a feature from the NXG design. The BEP indicated that a significant amount of the NXG $100 note paper was contaminated with "trash."
Nov 2009	The paper manufacturer continued to have problems with the paper production, specifically with the 3-D security ribbon. ICD workgroup meeting minutes mentioned adding a new security feature to the NXG $100 note, and members discussed that the manufacturer was having technical issues with the feature that required further quality control.
Dec 2009	Board staff, in collaboration with the BEP, planned to establish a quality assurance program for U.S. currency to ensure that all notes met the needs of the Federal Reserve and the public. Staff planned to engage outside consultants to assist in the development of this program.
Jan 2010	The USSS provided a statement indicating that implementing the new security feature mentioned in the November 2009 ICD workgroup meeting minutes was important to prevent counterfeiting. The BEP indicated that the limited testing performed to date showed no evidence that the new feature would create a problem in its manufacturing systems or on finished banknotes. Both BEP facilities (ECF and WCF) started production of the NXG $100 note.
Mar 2010	The Board and the USSS representatives visited the BEP and discovered a quality issue with the note. As a result, the BEP stopped production temporarily to fix the quality issue identified.
Apr 2010	On April 21, officials from the Board, the Department of the Treasury, and the USSS unveiled the new design for the NXG $100 note and announced that it would be issued on February 10, 2011.
Jun 2010	WCF was processing approximately 200,000 NXG $100 note sheets daily. The plan was to provide the Board with 2 billion notes by February 2011.
Jul 2010	WCF experienced severe creasing. Creasing was also seen at the ECF, but initially not as severe as the WCF.
Aug 2010	The BEP was in jeopardy of not being able to meet the NXG $100 delivery requirements.
Aug-Dec 2010	The BEP was working with the paper manufacturer to understand and correct the creasing problem through eight paper trials.
Sep 2010	WCF ceased NXG $100 note production–converted NXG $100 press lines to other denominations. ECF reduced NXG $100 note production and began preparations for resuming the currently used $100 note production.
Oct 2010	The Board announced a delay in issuance of the NXG $100 note. The Board awarded a "Quality Assurance for Federal Reserve Notes" contract to a consulting firm on October 6 (not specifically for the creasing issue).

Appendix 1 – Timeline (continued)

Dec 2010	Testing to determine the cause of creasing continued.
Feb 2011	The Board expanded an October 6, 2010, contract with a private consulting firm to conduct a failure analysis of the creasing issue and validate paper manufacturer/BEP conclusions regarding the resolution of the creasing problem.
Apr 2011	The private consulting firm issued an interim report on its "Evaluation of the Creasing Issue."
Jun 2011	Research efforts for an SNI system were in process.
Jul 2011	The latest test data showed a reduction in creasing to extremely low, manageable levels. Cost/benefit analysis for an SNI system was developed and submitted to RBOPS.
Sep 2011	The production validation phase started at the WCF.

Appendix 2 – Division Director's Comments

BOARD OF GOVERNORS
OF THE
FEDERAL RESERVE SYSTEM
WASHINGTON, D.C. 20551

LOUISE L. ROSEMAN
DIRECTOR
DIVISION OF
RESERVE BANK OPERATIONS
AND PAYMENT SYSTEMS

January 3, 2012

Mr. Mark Bialek
Inspector General
Office of the Inspector General
Board of Governors of the Federal Reserve System
Washington, DC 20551

Dear Mark:

We appreciate the opportunity to review the Office of Inspector General's draft report entitled *Review of RBOPS Oversight of the Next Generation $100 Note*. We are pleased with the OIG's findings that the actions the Board has taken appropriately address the current printing problems and enhance controls to minimize the likelihood of future printing problems. As the report notes, Board staff is participating in the assessment of plans for the disposition of the 1.4 billion $100 notes printed that may contain various defects, including creasing.

We expect that the new production validation process we are working with the BEP to implement will provide a more effective method to identify and resolve technical problems before beginning full-scale production of any new note designs. The new process replaces the requirement in the 1998 memorandum of understanding (MOU) between the Board and the BEP that required the two agencies to agree to a limited initial production quantity of newly designed currency before starting full-scale production. The BEP and the Board did not establish an initial production quantity before production began on the next generation $100 note, and even if we had done so, it would not have identified this particular problem. Systemic creasing did not occur until after a large quantity of notes had been produced, and a limited initial production quantity would have been far below this level. In addition, we were informed by the BEP that it had successfully completed pre-production testing before it began full production.

As you know, in response to the continuing quality problems at the BEP, RBOPS was in the process of enhancing its oversight of the BEP at the time of your assessment. First, we reorganized our Cash section into two sections to allow some staff to focus more closely on BEP quality assurance. In addition, we hired a consultant to review the BEP's quality assurance

Appendix 2 – Division Director's Comments (continued)

system and to assist the BEP in correcting any deficiencies. Finally, we worked with the BEP on a new MOU to define more explicitly roles and responsibilities regarding note design, development, and production; quality assurance and standards; corrective and preventative actions; change control; and oversight of the BEP.

We recently finalized the new MOU; the Treasurer of the United States and I signed it on behalf of the BEP and the Board on December 22, 2011. The MOU took effect on that date. As recommended in your report, we will work with the other members of the Advanced Counterfeit Deterrence Steering Committee to finalize the Interagency Currency Design workgroup charter.

We thank the review team for its collaboration with RBOPS staff, and we appreciate the constructive feedback we received. We have provided technical comments on the draft report to the review team under separate cover.

Sincerely,

Appendix 3 – Office of Inspector General Principal Contributors to This Report

Victor Calderon, Project Leader and Senior Information Technology Auditor

David Horn, Auditor

Timothy P. Rogers, Office of Inspector General Manager