

WHITE PAPER REGARDING MEANINGFUL ACCESS TO U.S. CURRENCY FOR BLIND AND VISUALLY IMPAIRED INDIVIDUALS

June 27, 2013

EXECUTIVE SUMMARY

The mission of the Bureau of Engraving and Printing (BEP) is to develop and produce U.S. currency (Federal Reserve notes) that is trusted worldwide. As its primary function, the BEP prints approximately 6.5 to 8.5 billion Federal Reserve notes each year depending on an annual order from the Board of Governors of the Federal Reserve System (the Board). As the issuing authority, the Board takes delivery of the Federal Reserve notes from the BEP and issues them to the Federal Reserve Banks which, in turn, distribute them to the public through depository institutions that have a Federal Reserve account.

In June 2012, the Senate Committee on Appropriations issued Senate Report 112-177. This report directed “the BEP to report to Congress and to Treasury’s Office of Inspector General (OIG) within 90 days of enactment [the 2013 Financial Services and General Government Appropriations bill] on a detailed plan, including a timeline, to develop, design, test, and print currency with accessibility features. The plan should also include an analysis of the feasibility of expediting the Federal acquisition process for the specialized equipment required to create accessibility features. The Committee directs the OIG to provide an initial assessment of the plan to the Committee within 60 days of receipt and to report on its progress and implementation every 6 months thereafter until the plan is fully implemented.” Although the legislation accompanying the Senate Report was not enacted, given the high level of interest, and to enhance communication and openness, the BEP is submitting this white paper to the Treasury OIG and the Senate Committee on Appropriations.

In October 2008, the United States District Court for the District of Columbia issued its ruling in *American Council of the Blind v. Paulson*, holding that the Secretary of the Department of the Treasury “violated Section 504 of the Rehabilitation Act,” and requiring the Secretary to “take such steps as may be required to provide meaningful access to United States currency for blind and other visually impaired persons” in conjunction with the subsequent redesign of each denomination of currency approved by the Secretary.

To take a comprehensive, informed approach, the BEP commissioned a study in 2008 to: (1) review and analyze the needs of the blind and visually impaired community; (2) examine methods available at that time that could potentially improve access to Federal Reserve notes; (3) perform a cost impact analysis of the possible accommodations on various government and industry sectors; and (4) provide a decision model whereby the BEP could compare and contrast various accommodations. The BEP published the final study report on its website when it was received in July 2009.

Results from the study confirmed that there is no single solution that will enable all segments of the blind and visually impaired population to denominate U.S. currency with 100 percent accuracy. As such, the BEP recommended three actions to the Secretary of the Treasury to provide meaningful access, which were approved on May 31, 2011. Those accommodations are:

1. Inclusion of a raised tactile feature to each Federal Reserve note the BEP is permitted by law to alter.¹ This feature would provide users with a means of identifying each denomination via touch;
2. Continuation of the process of adding large, high-contrast numerals and different colors to each denomination that the BEP is permitted by law to alter; and
3. Distribution of currency readers to blind and visually impaired U.S. citizens and those legally residing in the United States that would allow users to denominate U.S. currency.

In addition, since the 2008 order was issued, technology has advanced dramatically. Accordingly, the BEP has provided immediate accommodation to a segment of the blind and visually impaired population by issuing banknote denominating applications (apps) for mobile devices.

The BEP has made progress implementing the Secretary's approved accommodations. First, the BEP has performed rigorous analyses of several aspects of applied tactile features. The BEP is evaluating material and application methods for ease of application, cost, and tactility, in addition to durability in circulation. The BEP continues to test various patterns and shapes of tactile features to optimize their effectiveness for the blind and visually impaired community.

The BEP anticipates it will have the application method (which determines the equipment type required) selected in December 2013 and the application material selected by January 2015. At this point, the tactile feature will be ready for transfer to the banknote development process, which is the incorporation of features into a design concept that has been purposefully developed to accommodate all the security and functionality requirements for banknotes in the environment in which they will circulate. The banknote development process is designed to end in a secure, producible Federal Reserve note.

As part of the next Federal Reserve note redesign process, in addition to the raised tactile feature, the BEP will continue to include large, high-contrast numerals similar to the \$5 note issued in 2008 to help the visually impaired better denominate U.S. currency.

As noted previously, the BEP has already provided currency readers to a segment of the blind and visually impaired population by issuing banknote denominating apps for mobile devices. The larger (not mobile app) currency reader distribution program is planned for a nationwide launch in 2015. The BEP is in the process of procuring currency readers and acquiring additional program resources for administering the program. The BEP is also working with the National Library Service of the Library of Congress (NLS), which provides book readers to the blind and visually impaired, to develop an Inter-Agency Agreement whereby NLS would assist the BEP in distributing currency readers.

¹ Under current law, the Department of the Treasury is not permitted to redesign the \$1 Federal Reserve note. The Consolidated Appropriations Act of 2012, Public Law 112-74, 125 Stat. 786, 890, states that "None of the funds appropriated in this Act or otherwise available to the Department of the Treasury or the Bureau of Engraving and Printing may be used to redesign the \$1 Federal Reserve note."

Tactile features will be incorporated through the U.S. currency redesign process, the timing and content of which is largely driven by the level and nature of security threats to Federal Reserve notes. At the same time as BEP is developing tactile features, it is working closely with the Board, the United States Secret Service (USSS), and the Departmental Offices of the Treasury (Treasury) to identify threats and determine appropriate measures to respond to them. Redesign often requires seeking out and developing technology for both overt and covert security features, which requires a lengthy technical development process. As with tactile features, security features developed through the technical development process are transferred to the banknote development process for integration into a producible Federal Reserve note. Due to the interrelated nature of the various processes, the overall creation of any one Federal Reserve note design is a lengthy and complex endeavor.

The BEP, therefore, anticipates that the first redesigned denomination containing a tactile feature, an improved large, high-contrast numeral, and new security features to be released for circulation in 2020. The estimated timeline for the complete process is shown in Figure 1.

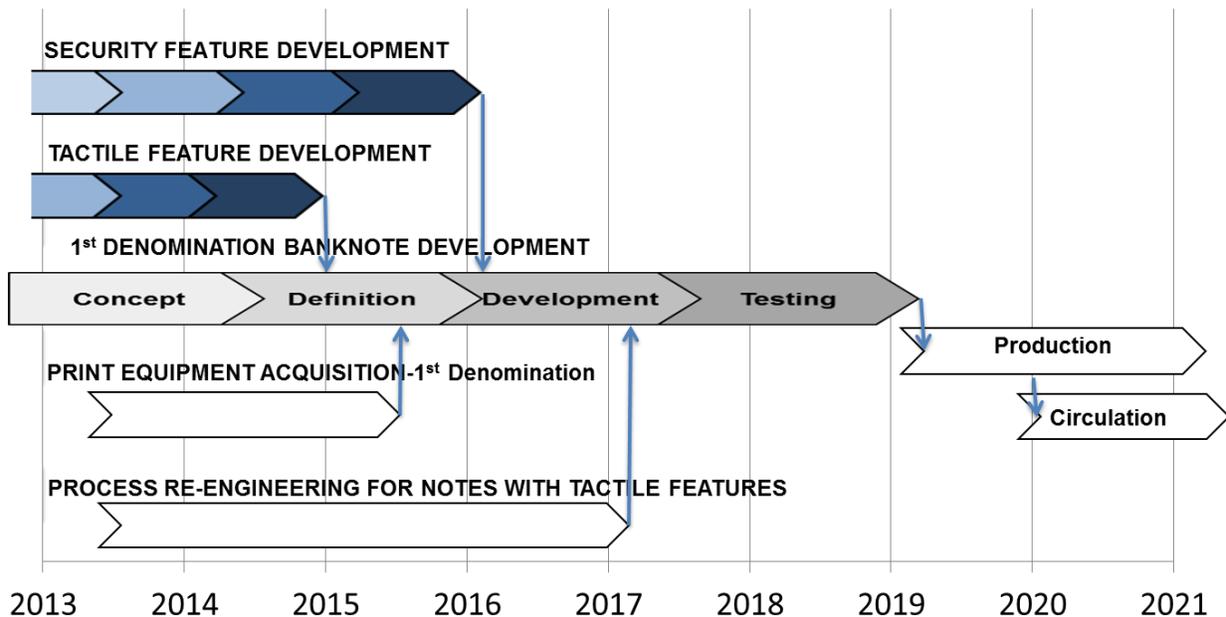


Figure 1. Timeline to commence circulation of first denomination with tactile feature

At this time, testing for a potential application method is being conducted at contractor sites, before the BEP acquires any additional equipment required to add tactile features to Federal Reserve notes. Any acquisition will only proceed once an application method has been selected. The BEP will do all that it can to accelerate the acquisition of this equipment while complying with the requirements to the Federal Acquisition Regulation. At present, the BEP does not plan to seek a waiver from full and open competition.

The projection of initial circulation of redesigned currency with a tactile feature in 2020 depends on much more than just the successful design and integration of a tactile feature. The release date is also dependent on technology/security feature development, production issues, and other unanticipated developments.

We anticipate that the next redesigned denomination, the first one with the tactile feature, will be the \$10 Federal Reserve note. When deliberating the various options for the next denomination to be redesigned, the Advanced Counterfeit Deterrence Steering Committee (ACD)² engages in a detailed analysis consisting of a counterfeit threat assessment, the state of security feature development to counter such threats, production capabilities and complexities, societal issues, relative use of various notes in transactional commerce, and impact on consumers and banknote equipment manufacturers. Following its analysis, the ACD recommended the \$10 note. The \$10 note was also selected because it is a transactional note used frequently in commerce and it has a low production volume, which will allow for the smoothest transition of a new complex design to manufacturing. Once production begins, the Board, as the issuing authority, will determine when the redesigned \$10 Federal Reserve note is put into circulation. However, should security threats against another denomination occur, the next denomination to be redesigned could change.

Development of a durable, easy to use tactile feature for the blind and visually impaired is a priority for the BEP, and its most senior personnel have been tasked with this complex endeavor.

BACKGROUND

In May of 2002, the American Council of the Blind, a national advocacy group representing the blind and visually impaired community, and two visually impaired individuals, brought suit against the Secretary of the Treasury alleging that the Department of the Treasury was not providing meaningful access to the currency for blind and other visually impaired individuals, and thus was in violation of Section 504 of the Rehabilitation Act, 29 U.S.C. § 794.

On October 3, 2008, the United States District Court for the District of Columbia (Court) issued its ruling in *American Council of the Blind v. Paulson*, that the Secretary violated Section 504 of the Rehabilitation Act, and required the Secretary to “take such steps as may be required to provide meaningful access to United States currency for blind and other visually impaired persons” in conjunction with the subsequent redesign of each denomination of Federal Reserve notes approved by the Secretary. The Court specifically recognized the complexity of banknote design and ordered that action be taken within the context of the next currency redesign. This is the schedule the BEP is working toward, as the yet uncirculated \$100 Federal Reserve note is the final note of the last redesign. The Court also required the BEP to provide a status report every six months. The order does not apply to the \$1 Federal Reserve note, which the BEP is prohibited from redesigning, or the redesigned \$100 Federal Reserve note that is scheduled to begin circulating in October 2013.

In January 2008, prior to the Court’s October 3 ruling, the BEP commissioned a comprehensive study to: 1) review and analyze the needs of the blind and visually impaired community; 2) examine methods available at that time that could potentially improve access to Federal Reserve notes; 3) perform a cost impact analysis of the possible accommodations on various government

² The Advanced Counterfeit Deterrence Steering Committee (ACD) is comprised of senior-level officials from the Department of the Treasury, the Federal Reserve System, and United States Secret Service who coordinate the counterfeit deterrence activities of the government agencies involved in the U.S. currency program.

and industry sectors; and 4) provide a decision model whereby the BEP could compare and contrast various accommodations. The BEP received the results of the study in July of 2009. That report is posted on the BEP website at:

http://www.moneyfactory.gov/images/ARINC_Final_Report_7-26-09.pdf.

The report outlined the cost-benefit analysis for note size variation, tactile features, machine-readable features and currency reader devices. Based upon the study and the BEP's experience in banknote design and manufacturing, the BEP concluded that there is no single solution that will enable all segments of the blind and visually impaired population to denominate Federal Reserve notes with 100 percent accuracy. Therefore, the BEP recommended three strategies to permit those who are blind or visually impaired to denominate U.S. currency accurately and quickly, and which at the time did not appear to place an undue burden on the BEP, the Federal Reserve System, U.S. businesses, or domestic and international users. These recommendations went above and beyond the Court's 2008 Order, and expanded the scope of the BEP's plans to improve access to currency for blind and visually impaired persons. As we move forward, additional societal and government costs will be considered.

The BEP posted its proposed recommendations in the Federal Register in May, 2010, considered approximately 50 public comments submitted in response to that notice, consulted with the Interagency Currency Design Group (ICD)³, and received concurrence from the Advanced Counterfeit Deterrence Steering Committee (ACD) on the proposed course of action. The BEP recommended the following:

1. Include a raised tactile feature on each Federal Reserve note the BEP is permitted by law to alter. This feature would provide users with a means of identifying each denomination via touch;
2. Continue the practice of adding large, high-contrast numerals and different colors to each denomination that the BEP is permitted by law to alter; and
3. Distribute currency readers to blind and visually impaired U.S. citizens and those legally residing in the United States that would allow users to denominate U.S. currency.

The BEP recommended that the currency reader program be implemented as soon as possible to provide an accommodation to the blind and visually impaired population, while addressing the inevitable period of transition during which Federal Reserve notes with and without tactile features and large, high-contrast numerals will co-circulate. The Secretary of the Treasury approved the proposal on May 31, 2011, pursuant to his authority under 12 U.S.C. § 418 to make final decisions relating to currency design.

³ The purpose of the Interagency Currency Design Group (ICD) is to provide the management infrastructure to support the policies and strategies of the Advanced Counterfeit Deterrence Steering Committee to carry out all the activities necessary to design and produce Federal Reserve notes that meet the security and functional requirements for all users and stakeholders. It consists of senior executives from the Department of the Treasury, the Bureau of Engraving and Printing, the Federal Reserve System, and the United States Secret Service.

To enhance the accessibility of Federal Reserve notes, the BEP considered several options including variable size banknotes, notches, materials embedded in or applied to the surface of the substrate, machine readable materials, and perforations. Based on the information contained in the 2009 study, published information regarding scientific study based on the sense of touch, referred to as “haptic” response, and the effectiveness of tactile features in banknotes around the world, the BEP decided the best method of providing a means to denominate Federal Reserve notes by touch was to develop a raised tactile feature for application to the surface of the banknote. Since approval of this approach, significant progress has been made.

DEVELOPMENT OF THE TACTILE FEATURE

The BEP continues to perform rigorous analyses of several aspects of applied tactile features. For example, the BEP is testing, for durability and producibility, features using special inks and other materials applied to the surface of the substrate, features embedded into the substrate, features that involve alterations to the substrate, and features using intaglio⁴ print techniques. The BEP is developing options internally and with outside vendors, and has defined a selection methodology to identify the most durable and effective tactile feature possible.

The location of a tactile feature on a Federal Reserve note appears not to be critical to its interpretation; users can be educated as to the location. There are, however, considerations that make some locations preferable to others. For instance, locating the tactile feature along either the top or bottom (horizontal) edge of the Federal Reserve note allows users to utilize the feature without removing the banknote completely from a wallet or purse. Many who participated in feature reviews expressed this preference.

The BEP has also investigated the design of the tactile feature element, combinations of elements to form a denomination scheme, materials, application methods, materials used to increase adherence, and the position of the feature on the banknote. The BEP chose not to directly adopt tactile features used by other countries given the higher durability requirements for the worldwide circulation of Federal Reserve notes and the extended life of those notes in circulation.

The BEP conducted a usability study in 2011 with a subject matter expert in the field of touch perception to identify the most perceptible and effective tactile feature symbol designs. In addition, over the past two years the BEP has shared various samples containing prototype raised tactile features with members of the blind and visually impaired community at a variety of conferences, conventions, and meetings to get feedback regarding the usability of the different styles of features being investigated. The BEP has developed a protocol for testing the usability of potential features, in concert with experts in such studies and several advocacy organizations.

As a result of this research, the BEP has narrowed down the field of possible features and is now testing these features. It is anticipated that the application method (which determines the

⁴ Intaglio (in-TAL-ee-oh) is a printing technique in which an image is incised into a surface and the incised lines hold the ink for transfer to the substrate under pressure.

equipment type required) will be selected in December 2013 and the application material will be selected by January 2015. Selection of an acceptable material and application method involves evaluation for ease of application, cost, and tactility (governed by several factors), in addition to retention on the substrate, and durability with extended wear. The BEP must ultimately select a combination that is durable, cost-effective to produce, compatible with high-speed manufacturing and processing equipment, and minimally impacts existing cash handling and banknote verification machines.

After considering a large number of options and feedback from the blind and visually-impaired community, the BEP is proceeding with a single symbol design and denominating scheme. Based upon its current research efforts, the BEP has determined a hollow rectangle to be highly perceptible by touch (Figure 2). The notional size for each single rectangle is 6mm (vertical) by 4mm (horizontal).



Figure 2. Most Likely Tactile Feature Shape

This conclusion was reached after exploring prototype samples that contain different symbol shapes including circles, triangles, ovals, slanted lines, six-dot clusters, and others that were evaluated by members of the blind community. In order to validate the information acquired during these informal sessions with blind users, the BEP contracted a subject matter expert to conduct a formal, scientifically-based acuity study designed to compare the relative ease with which the various symbol shapes could be recognized by touch. The results of this study, conducted in late 2011, clearly validated the results of the information informally collected by the BEP.

To date, the most promising denominating scheme appears to be a 4-position pattern (Figure 3), with a 14mm spacing between adjacent symbols (18mm on center) to enhance the user's ability to distinguish single symbols within the denominating scheme. The user would denominate the note by the number and location of elements in the pattern. This scheme represents a good balance between ease of use and optimization of available space on the surface of a Federal Reserve note. An added advantage to this scheme is its similarity to that used on Canadian banknotes that have been in circulation for many years and have been accepted by blind users.



Figure 3. Likely Denominating Feature for \$50 note. The pattern for the \$50 was used because it shows the maximum impact on the design and it represents all possible locations of the pattern on the note.

Because of long lead time necessary to address the significant security feature development and process issues discussed below, the BEP estimates that the redesigned \$10 Federal Reserve note containing a tactile feature and new security features will be ready for production in 2019. From

that point, it is estimated that it will take six to twelve months to print enough Federal Reserve notes to meet Board requirements prior to the banknotes entering circulation in 2020.

DEVELOPMENT OF LARGE, HIGH-CONTRAST NUMERALS

In 1997, the BEP began adding large, high-contrast numerals and different colors to U.S. currency. This was part of the redesign of the Series 1996 \$50 Federal Reserve note. In March 2008, the BEP introduced the current \$5 Federal Reserve note design, which improved upon the earlier design by increasing the size and contrast of the large numeral. The feedback received from visually impaired individuals regarding their ability to independently denominate Federal Reserve notes by using these numerals has been positive. This feature was continued in the redesigned \$100 Federal Reserve note scheduled for release in 2013, and the BEP will continue to refine this feature in future U.S. currency redesigns. Specifically, as part of the Federal Reserve note design process, the BEP will explore a number of options concerning the size, color, placement, background contrast, and other attributes for these large numerals with the aim of improving accessibility of Federal Reserve notes for persons with visual impairments.

DEVELOPMENT OF THE CURRENCY READER PROGRAM

Based on the study completed in 2009, the BEP recommended a currency reader distribution program in which the BEP would provide a currency reader to eligible blind and visually impaired persons at no cost to them. A currency reader is a small hand-held device that identifies the denomination of an individual Federal Reserve note when a user inserts the banknote into the device. The currency reader program aims to provide a means to denominate U.S. currency during the co-circulation of Federal Reserve notes with and without a tactile feature and large, high-contrast numeral. The BEP intends to launch the currency reader distribution program in advance of issuing tactile-enhanced Federal Reserve notes. The BEP expects this currency reader program to be needed for many years because: 1) current law prohibits redesign of the \$1 Federal Reserve note; 2) tactile-enhanced Federal Reserve notes are expected to be issued one denomination at a time; and 3) current-design notes without tactile features are expected to co-circulate with tactile-enhanced Federal Reserve notes for many years.

Given these restrictions, the BEP intends to launch a nationwide rollout of the currency reader program in 2015. To that end, the BEP is in the process of procuring currency readers and acquiring additional program resources for administering the program, and expects to award a contract in 2014. The BEP is in discussions with the National Library Service (NLS) of the Library of Congress to obtain its support in administering elements of the currency reader program for the BEP through an Inter-Agency Agreement (IAA). Indeed, the BEP's framework for the currency reader program is inspired by the NLS program to loan library materials and book readers to blind and other disabled persons. The BEP therefore believes that obtaining NLS support will add efficiency to development and implementation of the currency reader program.

To support the IAA, in June 2013, the Government Accountability Office (GAO) issued an opinion that it was acceptable to transfer title (ownership) of currency readers to blind and visually impaired individuals, as opposed to lending readers. This will reduce the burden of

administering a loaned reader program and the BEP is moving forward with a program designed around giving currency readers to eligible individuals.

DEVELOPMENT OF TECHNOLOGY-BASED APPLICATIONS

In the Federal Register notice published in 2010, the BEP indicated that in addition to the three recommended approaches, it would continue to explore emerging technological solutions to provide improved access to Federal Reserve notes to the blind and visually impaired. The BEP recognized that the proliferation of mobile phones used by consumers, specifically a growing number of blind and visually impaired individuals, created an additional opportunity to use technology as way to provide meaningful access to currency.

To seize this opportunity, in 2010, the BEP developed the EyeNote® application (app), designed to allow individuals to scan and denominate Federal Reserve notes using a mobile device operating on the Apple iOS platform. The app is available as a free download on the Apple App StoreSM. The BEP also collaborated with the Department of Education to introduce a similar, free app that operates on Android-based mobile devices; the IDEAL Currency Reader interacts with Google’s “Eyes-Free” application and can be downloaded from Google Play. These applications are providing an immediate accommodation for a segment of the blind and visually impaired population, and may result in lower demand for currency readers.

OTHER CONSIDERATIONS

Security Features Development

U.S. currency redesign is primarily done in response to security threats posed by banknote counterfeiting. As the quantity and sophistication of threats to Federal Reserve notes increase, so must the complexity of the security features embodied in future designs. The Treasury, the BEP, the USSS, and the Board work closely together to monitor threats to U.S. currency, and to identify and develop new security features to counter those threats. The ACD makes recommendations to the Secretary of the Treasury on redesigns, directs the development of advanced deterrent technology, and coordinates public education related to the latest designs and features to deter counterfeiting. A typical Federal Reserve note design will include several different levels of security features, each specifically designed to permit detection and rejection of counterfeits by the Federal Reserve System and users of U.S. currency.

The primary strategic goals of redesign are to: 1) include in Federal Reserve notes unique and technologically advanced features to deter counterfeiting; 2) facilitate the public’s use and authentication of Federal Reserve notes, and; 3) promote global public confidence in U.S. currency. The development of features or technologies uses a structured approach, referred to as the technology development process. This process, while still under development, is intended to ensure that the requirements of the numerous stakeholders are met, and promote an organized and logical exploration of emerging technologies to “stay ahead” of counterfeiters and constantly-advancing technologies, materials, and processes available to them. This structured approach is depicted in Figure 4.



Figure 4. Technology Development Process

The technology development process utilizes multiple sources for new security technologies, including National Academy of Sciences studies, internal research and development, technical conferences, market sector vendor outreach, industry experts, other Federal agencies, and national laboratories. This formal process, with stage-gate reviews for evaluation of potential security features, is an integral part of the BEP’s methodology to achieve its strategic objectives. Each idea is carefully screened and evaluated by an interagency technical group. Promising features are subjected to thorough evaluation of feasibility. Features determined to be feasible are subjected to a rigorous test and optimization process, from prototyping through large scale manufacturing. Ultimately, features selected are transferred into the banknote development process (BDP) where all features and design components are integrated into a producible, highly secure Federal Reserve note. This structured approach is depicted in Figure 5.



Figure 5. Banknote Development Process

The newly redesigned \$100 Federal Reserve note provides an outstanding illustration of the challenges that can result from inclusion of new security features in a banknote. The new \$100 Federal Reserve note includes several new anti-counterfeiting features, including a three-dimensional security ribbon that appears to be “woven” into the substrate, and a feature in which the image of a bell disappears and reappears as its color changes when tilting the banknote. These features, more sophisticated than those previously incorporated into Federal Reserve notes, caused several manufacturing problems that the BEP did not foresee. Specifically, during initial production it was noticed that occasionally a sheet of notes (32 banknotes per sheet) would crease. The BEP, along with the Board, the USSS, and our suppliers have been working to understand the cause of the creasing, and to mitigate the causes of this problem. The BEP is now successfully printing the new \$100 Federal Reserve notes and the Board has announced they are scheduled to begin circulating in October 2013.

The Federal government has already begun planning a new family of Federal Reserve note designs. In November 2012, the ACD endorsed a recommendation that the next denomination to be redesigned should be the \$10 Federal Reserve note and that, in addition to the tactile feature, it must include new security features that facilitate the goal of staying ahead of emerging counterfeit threats. To prevent the problems that arose with the \$100 Federal Reserve note, the BEP has implemented a more sophisticated and rigorous pre-production process, along with continuous quality improvement. This process is part of the Currency Quality Assurance (CQA) program and is aimed at ensuring that future U.S. currency designs meet all of the needs of the BEP’s stakeholders, are producible, and are developed as efficiently as possible under a more formal and controlled protocol.

Design of New Banknotes

The CQA process is a joint effort between the BEP and the Federal Reserve Board, and has included the services of an external organization with product quality expertise. The CQA process has defined a robust technology and product development process for all Federal Reserve note redesigns.

The technical development process and the banknote development process guide the development of a single Federal Reserve note. For any one denomination, these two processes are expected to take 10 to 12 years, or longer should an adequate number of security features fail to reach maturity. The ACD has adopted a policy of developing Federal Reserve note designs as a family. Banknotes within a family usually have a very similar architecture, but may have different security features depending on the nature of the security threat. Because of this, each Federal Reserve note redesign within a family is undertaken individually, which produces a staggered, denomination-specific development schedule.

Production

The final stage of the banknote design process is testing or production validation. During this phase, banknote presses run up to full-production speeds and variations are introduced to determine the sensitivity of the production process. Once the process is understood and optimized, full-rate production can begin. U.S. currency production involves a system of six printing and processing steps. Assuming that the tactile feature application is a separate operation within the larger production process, the time required for a Federal Reserve note to go through the production process would be approximately 35 calendar days.

Re-engineering the Production Process

Depending on the tactile feature selected, it is likely that the BEP will need to purchase equipment in order to apply the tactile element to the Federal Reserve note substrate. Installation of this equipment will require integration into current production and IT systems and may require facilities renovation. The amount of equipment required for a new design depends upon a number of factors, including the number of Federal Reserve notes of each denomination to be printed.

The complexity of this challenge should not be underestimated; adding a tactile feature will significantly complicate the Federal Reserve note production process. To maximize utility for target users, the tactile features will be located in one position on the note adding thickness to stacks of notes; the added thickness will create feeding, cutting and packaging, as well as inventory issues for Federal Reserve notes, which will likely render current equipment incapable of processing them without costly modifications. Modifications may also be required to the Board's inventory control and accountability systems and its high-speed sorting equipment as well, driven by the increased thickness of banknotes with tactile features. The BEP is currently exploring the impacts of these factors, and will do so in great depth as part of the BDP.

Additionally, the BEP will need to work closely with commercial Banknote Equipment Manufacturers (BEMs), whose cash-handling equipment will be impacted with the addition of tactile features to the Federal Reserve notes. As a general practice, the BEP provides test decks of redesigned banknotes for BEMs to use in upgrading their equipment. The BEP will continue this practice at various stages of development and production of the redesigned \$10 Federal Reserve note, to support industry's readiness to recognize and accept the new banknote design.

Equipment Procurement

The Federal Acquisition Regulation (FAR) establishes a comprehensive set of procedures that ensures broad, fair competition, a standardized acquisitions process, and lower costs to the government. In addition, the FAR implements the provisions of the Small Business Act, designed to help small/disadvantaged businesses participate in the Federal government's procurement of goods and services. Because the Federal acquisition process can take significant time to complete, adequate time must be included in the acquisition lead-time for proper execution of all required steps.

Acquisition of modified commercially available equipment will certainly require less time than purpose-built equipment. Given the high priority of this task within the BEP, coupled with a plan for direct involvement from senior BEP staff, the process will move in the most efficient manner possible. The BEP will capitalize upon every opportunity to accelerate the acquisition process wherever possible, and thus reduce the time it takes to procure the necessary equipment and materials needed, but does not plan to seek a waiver to the requirements of the FAR for full and open competition.

Equipment Installation and Integration

Much of the existing processing equipment at the BEP may be capable of processing Federal Reserve notes with tactile features only after modification. Specifically, due to the change in thickness of a banknote with a tactile feature, it is expected that significant modification and/or replacement of machinery may be required in the cutting, stacking, and packaging operations that occur in the latter stages of the banknote production process. Any new or modified equipment must be integrated into the current production process. An analysis to determine the impact of this change is included in the BDP.

The new equipment must also be integrated into the current networked applications designed to manage the high degree of automation and accountability of security paper, ink, and other elements in the production process.

Installation of new machinery also requires extensive modification of facilities to include structural, mechanical, electrical, and plumbing upgrades to support machinery. In addition, the modification must be sequenced carefully to minimize impact to the production schedule. Due to the age of the current buildings at the BEP's Washington, DC facility, the process to prepare a space for installation of new equipment could take up to three years and cost between \$3 and \$4 million.

Other Impact

Any new currency design impacts many stakeholders besides the BEP, the Department of the Treasury, and the Federal Reserve System. Many of these stakeholders are likely to incur costs in order to accommodate a Federal Reserve note with tactile features. Devices produced by BEMs may require modification or replacement. Automated Teller Machine (ATM) currency cassettes and handling machinery may require redesign or more frequent replacement to accommodate Federal Reserve notes with tactile features. The vending machine industry may likely experience a similar impact. These costs are likely to be significant.

The tactile feature selected must also be resistant to damage caused by handling machinery and unlikely to damage that same machinery. The BEP, the Department of the Treasury and the Board are aware of these potential impacts, and are working to balance them against the need to field a durable tactile feature that can be readily used by blind and visually impaired persons.

SUMMARY

Development of a durable, easy-to-use tactile feature for the blind and visually impaired is a priority for the BEP, and its most senior personnel have been tasked with this complex endeavor. The BEP has made progress in its Meaningful Access Program. Development of features to provide enhanced access to Federal Reserve notes has been underway at the BEP since 2008. The BEP has been involved in development of both iOS- and Android-based mobile phone applications for denominating currency, which have been available since 2010.

Table 1. Major Milestones in BEP Meaningful Access Program

Intaglio, Coating and Rotary Screen Press Print Trials	Ongoing
Analyze Process Re-engineering and Plant Modifications Requirements	Ongoing
Select Tactile Feature Application Method (Equipment Type)	Dec 2013
Select Tactile Feature Application Material	January 2015
Currency Reader - National Roll-out	2015
Complete Security Feature Development	Early 2016
Complete Process Re-engineering and Plant Modifications (Approximate)	Early 2017
Complete 1 st Denomination Banknote Development Process (Approximate)	Early 2019
Commence Production Printing, Banknotes Delivered to Vault (Approximate)	Early 2019
Commence Circulation (Approximate)	Early-Mid 2020

The BEP is now working on the development of an effective tactile feature and is narrowing down the shape, pattern, material, and application method. The BEP expects to have the tactile feature material selected by January 2015, once the appropriate application method has been selected and tested.

The BEP has proven its expertise in developing large, high-contrast numerals and adding different colors to Federal Reserve notes. The BEP will continue to refine these proven denomination methods for future banknote designs.

Significant progress has been made to implement a currency reader program, with the assistance of the Library of Congress, which has experience in distributing free readers to the blind and visually impaired public. We expect the contract for procuring currency readers will be awarded next year, and the process to procure support services for the currency reader program has begun.

The Department of the Treasury and the BEP are committed to implementing the Secretary's recommendations and will continue to work with a sense of urgency. The BEP must balance this urgency with its obligation to provide secure Federal Reserve notes, and to do so following its structured banknote development and production processes. The BEP is confident that it will meet its goal to produce Federal Reserve notes that meet the needs of those who are blind and visually impaired, while maintaining public confidence in U.S. currency.