AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

THE PRODUCTION AND CIRCULATION OF COINS AND CURRENCY

HEARING

BEFORE THE

SUBCOMMITTEE ON MONETARY POLICY AND TRADE

OF THE

COMMITTEE ON FINANCIAL SERVICES

U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRTEENTH CONGRESS

SECOND SESSION

JUNE 11, 2014

Printed for the use of the Committee on Financial Services

Serial No. 113–83

U.S. GOVERNMENT PRINTING OFFICE

91–147 PDF WASHINGTON : 2014

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2104 Mail: Stop IDCC, Washington, DC 20402–0001

HOUSE COMMITTEE ON FINANCIAL SERVICES

JEB HENSARLING, Texas, *Chairman*

GARY G. MILLER, California, *Vice Chairman*
SPENCER BACHUS, Alabama, *Chairman Emeritus*
PETER T. KING, New York
EDWARD R. ROYCE, California
FRANK D. LUCAS, Oklahoma
SHELLEY MOORE CAPITO, West Virginia
SCOTT GARRETT, New Jersey
RANDY NEUGEBAUER, Texas
PATRICK T. MCHENRY, North Carolina
JOHN CAMPBELL, California
MICHELE BACHMANN, Minnesota
KEVIN McCARTHY, California
STEVAN PEARCE, New Mexico
BILL POSEY, Florida
MICHAEL G. FITZPATRICK, Pennsylvania
LYNN A. WESTMORELAND, Georgia
BLAINE LUETKEMEYER, Missouri
BILL HUIZENGA, Michigan
SEAN P. DUFFY, Wisconsin
ROBERT HURT, Virginia
STEVE STIVERS, Ohio
STEPHEN LEE FINCHER, Tennessee
MARLIN A. STUTZMAN, Indiana
MICK MULVANEY, South Carolina
RANDY HULTGREN, Illinois
DENNIS A. ROSS, Florida
ROBERT PITTENGER, North Carolina
ANN WAGNER, Missouri
ANDY BARR, Kentucky
TOM COTTON, Arkansas
KEITH J. ROTHFUS, Pennsylvania
LUKE MESSER, Indiana

MAXINE WATERS, California, *Ranking Member*
CAROLYN B. MALONEY, New York
NYDIA M. VELÁZQUEZ, New York
BRAD SHERMAN, California
GREGORY W. MEEKS, New York
MICHAEL E. CAPUANO, Massachusetts
RUBÉN HINOJOSA, Texas
WM. LACY CLAY, Missouri
CAROLYN MCCARTHY, New York
STEPHEN F. LYNCH, Massachusetts
DAVID SCOTT, Georgia
AL GREEN, Texas
EMANUEL CLEAVER, Missouri
GWEN MOORE, Wisconsin
KEITH ELLISON, Minnesota
ED PERLMUTTER, Colorado
JAMES A. HIMES, Connecticut
GARY C. PETERS, Michigan
JOHN C. CARNEY, JR., Delaware
TERRI A. SEWELL, Alabama
BILL FOSTER, Illinois
DANIEL T. KILDEE, Michigan
PATRICK MURPHY, Florida
JOHN K. DELANEY, Maryland
KYRSTEN SINEMA, Arizona
JOYCE BEATTY, Ohio
DENNY HECK, Washington
STEVEN HORSFORD, Nevada

SHANNON MCGAHN, *Staff Director*
JAMES H. CLINGER, *Chief Counsel*

SUBCOMMITTEE ON MONETARY POLICY AND TRADE

JOHN CAMPBELL, California, *Chairman*

BILL HUIZENGA, Michigan, *Vice Chairman*
FRANK D. LUCAS, Oklahoma
STEVAN PEARCE, New Mexico
BILL POSEY, Florida
STEPHEN LEE FINCHER, Tennessee
MARLIN A. STUTZMAN, Indiana
MICK MULVANEY, South Carolina
ROBERT PITTENGER, North Carolina
TOM COTTON, Arkansas
LUKE MESSER, Indiana

WM. LACY CLAY, Missouri, *Ranking Member*
GARY C. PETERS, Michigan
BILL FOSTER, Illinois
JOHN C. CARNEY, JR., Delaware
JAMES A. HIMES, Connecticut
TERRI A. SEWELL, Alabama
PATRICK MURPHY, Florida
KYRSTEN SINEMA, Arizona
DENNY HECK, Washington

CONTENTS

	Page
Hearing held on:	
June 11, 2014	1
Appendix:	
June 11, 2014	25

WITNESSES

WEDNESDAY, JUNE 11, 2014

Felix, Larry R., Director, Bureau of Engraving and Printing, U.S. Department of the Treasury	4
Mills, Andrew, Director, Circulating Coin, The Royal Mint, United Kingdom	9
Peterson, Richard A., Deputy Director, United States Mint, U.S. Department of the Treasury	6
St. James, Lorelei, Director, Physical Infrastructure Issues, U.S. Government Accountability Office	7

APPENDIX

Prepared statements:	
Fitzpatrick, Hon. Michael	26
Felix, Larry R.	27
Mills, Andrew	35
Peterson, Richard A.	193
St. James, Lorelei	201

ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD

Campbell, Hon. John:	
Written statement of former U.S. Representatives Jim Kolbe and Tim Penny, Honorary Co-Chairmen of the Dollar Coin Alliance	215
Written statement of Louise L. Roseman, Director, Division of Reserve Bank Operations and Payment Systems, Board of Governors of the Federal Reserve System	217
Peterson, Richard A.:	
Written responses to questions submitted by Representative Fitzpatrick	226
St. James, Lorelei:	
Written responses to questions submitted by Representative Fitzpatrick	227
Written response to a question posed during the hearing by Representative Clay	231

THE PRODUCTION AND CIRCULATION OF COINS AND CURRENCY

Wednesday, June 11, 2014

U.S. HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MONETARY
POLICY AND TRADE,
COMMITTEE ON FINANCIAL SERVICES,
Washington, D.C.

The subcommittee met, pursuant to notice, at 11:31 a.m., in room 2128, Rayburn House Office Building, Hon. John Campbell [chairman of the subcommittee] presiding.

Members present: Representatives Campbell, Lucas, Pearce, Stutzman, Mulvaney, Pittenger, Cotton; Clay and Heck.

Also present: Representative Stivers.

Chairman CAMPBELL. The subcommittee will come to order. Good morning, everyone. Welcome to the Monetary Policy and Trade Subcommittee Hearing entitled, "The Production and Circulation of Coins and Currency." I will now recognize myself for 5 minutes for an opening statement.

We would all like to have more coins and currency. And we probably generally take it for granted. But it doesn't happen by itself.

The purpose of this hearing—which is something I think this subcommittee should be doing periodically—is just to examine our physical coins and physical currency that we have. And whether there is anything we should be looking at to change or do differently relative to said currency because confidence in the security of our money is one of the strengths of this country.

We have had the benefit of a fairly stable exchange rate and interest-free loans on more than $1 trillion in money in circulation. But a good half of the physical currency in the form of $100 bills stays overseas.

But it is good to think about this. There is a lot of discussion. I am sure this will be a topic that a penny—I am trying to think if I have one in my pocket right now. I actually don't.

Oh, the ranking member has a penny. There we are. Oh look at that, he has a bunch of pennies.

One of the things we will be discussing is that this penny actually costs more than a penny to make. And some of our friends in Canada and in the United Kingdom have changed the makeup of their coins so that they don't cost more than the nominal value of the coin to make. So that is one of the things we will be discussing today.

But we will be looking at paper currency as well, as to the security of said paper currency, the volume of it that has been made.

And we need to also realize that in today's world, a lot of currency is digital. And I don't mean bit coins.

At this time, we will leave bitcoins and dogecoins and litecoins and all the rest of them for another hearing. But I simply mean using the kind of currency that instead of looking like this, looks something like this, and shows up on your phone or in your credit card rather than with physical currency.

So this hearing will be to analyze these things, look at these things, and hear from our distinguished panel of witnesses. Let me just briefly say who they are.

We have Larry Felix, Director of the Bureau of Engraving and Printing with the U.S. Department of the Treasury. We have Mr. Richard Peterson, who is the Deputy Director of the United States Mint in the U.S. Department of the Treasury. We have Lorelei St. James, who is Director of Physical Infrastructure Issues at the U.S. Government Accountability Office or GAO. And we have Andrew Mills, who is the Director of Circulating Coin at the Royal Mint in the United Kingdom.

So we have a panel of experts that we will be hearing from relative to coins and currency. And we look forward to their testimony.

And with that, I will recognize the gentleman from Missouri, the ranking member of the subcommittee, Mr. Clay, for 5 minutes.

Mr. CLAY. Thank you, Chairman Campbell, for holding this hearing regarding the production and circulation of coins and currency.

The Federal Reserve Cash Product Office (CPO) is charged with supplying adequate amounts of coin and currency. The CPO acts through the district Federal Reserve Bank to distribute and store coins and currency.

Last fall, the GAO found that the Fed manages coin and currency inventory that is aimed to ensure adequacy of supply. GAO suggested a number of methods that the Fed could take to improve its management. And I look forward to hearing from GAO regarding this issue.

Also, with the growth, as you mentioned, Mr. Chairman, in increasing diversity of payment methods such as debit cards and online payments, I would like to know, what is the future for coins and paper money? And are we moving to a totally plastic payment system?

Since the mid-2000s, the per unit cost of production and distribution of the penny and the nickel has exceeded each of the coin's per unit face value. In the U.S. Mint's most recent annual report for Fiscal Year 2013, the cost of production and distribution of the penny was $1.08, and the cost of the nickel production was $0.094.

The U.S. Mint lost $55 million on minting and issuing the penny and $40.5 million on the nickel. And I would like to know, what is the cost of production and distribution of the remaining coins such as the $0.50 coin?

Currently, Representative Stivers has introduced legislation that would mandate a change in the metallic composition of U.S. coins to plated steel to ease the cost of production. And I would like to know what is the position of the panelists regarding this legislation?

So again, thank you, Mr. Chairman. And we will keep on display my pocket full of coins just to have as a reference.

Chairman CAMPBELL. Thank you. And you had better count those coins because it might be pretty easy for me to take them.

The gentleman from North Carolina is recognized for 3 minutes for an opening statement.

Mr. PITTENGER. Thank you, Mr. Chairman.

Thank you for calling this hearing. And I thank each of the witnesses for being here today.

I do think it is of interest to each of us to know that you know what effects this will have in terms of any possible disruptive change in the process, the fears, are they overblown by the public, how it could be handled, and really how fast this change could be made in a seamless fashion.

Could it be done so with the new and existing coins? And what would be the problems of co-circulation?

And one other question I would have is, can you make a penny for less than a penny?

But I really appreciate your being here, and your thoughts today would be most welcome. Thank you.

I yield back.

Chairman CAMPBELL. The gentleman yields back. The gentleman from Washington, Mr. Heck, is recognized for 2 minutes.

Mr. HECK. Thank you, sir. I won't take the 2 full minutes.

Insofar as this is my first opportunity to attend the Subcommittee on Monetary Policy and Trade as its newest member, I did want to take this chance to just express how gratified and pleased I am after wanting to be on this committee for such a long period of time.

And to acknowledge that no small part of the reason was because of the reputation that both the chairman and the ranking member have for the way in which they provide leadership of this subcommittee. I am very gratified to be here. Thank you very much, sirs.

Chairman CAMPBELL. Thank you. That is very kind. We both appreciate it, and we don't deserve it, so okay.

We asked the Federal Reserve to come testify today. They said they couldn't. But they have sent us a statement which, without objection, we will enter into the record.

And then, we also have a statement from the Dollar Coin Alliance which, without objection, we will also enter into the record.

Okay. Opening statements having been completed, we will now move to our witnesses.

Just as a reminder, Mr. Felix is Director of the Bureau of Engraving and Printing. And you were named Director in January of 2006, so, you have been there for a little while. And you are responsible for overall operations of the Bureau of Engraving and Printing, and production of U.S. currency and other government-secured documents.

Mr. Felix, thank you so much for being with us this morning. You are recognized for 5 minutes.

STATEMENT OF LARRY R. FELIX, DIRECTOR, BUREAU OF ENGRAVING AND PRINTING, U.S. DEPARTMENT OF THE TREASURY

Mr. FELIX. Good morning. Thank you, Chairman Campbell, Ranking Member Clay, and distinguished members of the subcommittee, for holding this hearing and for inviting me to testify today on behalf of the Bureau of Engraving and Printing, and to talk about some of the initiatives.

The BEP is the security printer for the United States Government, and we provide technical assistance and advice to other Federal agencies in the design and production of security documents which, because of their inherent value or other characteristics, require counterfeit deterrence.

The BEP also reviews cash destruction and unfit currency operations at all of the Federal Reserve Banks. And as a free service to the public, we process claims for redemptions of mutilated paper currency. The mission of the BEP is to develop and produce United States currency that is trusted worldwide.

BEP has two facilities operating in Washington, D.C., and Fort Worth, Texas. And each facility is capable of producing all denominations. On average, the BEP produces approximately 7 billion notes per year. The BEP also produces security documents on behalf of other Federal agencies.

We work collaboratively through the Advanced Counterfeit Deterrence Committee, the ACD, which consists of the Board of Governors at the Federal Reserve System, the U.S. Secret Service, and the U.S. Treasury to improve counterfeit-deterrent features in our banknotes. But the primary reason for redesigning our notes is to continue to deter counterfeiting.

Since the mid-1990s—the U.S. Government has introduced its first major redesign of notes in over 60 years. And the redesign, those designs really occurred because of the emergence of a new category of counterfeiters who are using and leveraging digital technology in order to replicate notes.

October 8th of last year marked the introduction of the new $100 note. And that in effect marks the completion of our most recent design series.

I want to talk a little bit about meaningful access. A complaint was filed in the U.S. District Court in Washington, D.C., against the Treasury Department, alleging that United States currency violates Section 504 of the Rehabilitation Act because blind and visually impaired individuals aren't able to denominate the United States currency.

And so, an October 2008 court order decision directed that steps be taken to provide meaningful access to United States currency in our next redesign of notes. And we are beginning to plan for our next redesign of notes.

The BEP has been actively engaged in identifying meaningful access solutions to fully comply with the court's order, and while at the same time giving appropriate considerations to the interest of domestic and international users of currency, looking at the interests of the business community, and the cash handling and the cash-intensive industries.

The BEP proposed recommendations to the Secretary of the Treasury, who by statute has the sole authority for approving United States currency designs. The recommendations that we provided were: first, to pursue the development of a raised tactical feature for every note that we are legally, lawfully allowed to alter; second, to continue the use of large high-contrast numerals; and third, to introduce a Currency Reader Program. In 2011, the Secretary approved that three-prong strategy.

A key component of that three-prong strategy is to establish a nationwide currency redistribution program. The Currency Reader Program is designed as an effective method to enable people with visual impairments to denominate their currency.

The Currency Reader Program is expected to be a useful option for many, many years to come because: first, when we do introduce a tactually enhanced note, we will be doing it one denomination at a time; second, per congressional directions, we can't alter the $1 Federal Reserve note; and third, because we will be introducing it at a time when we expect both notes to co-circulate.

We plan to launch this currency redesign program, pilot it this summer. And we will roll it out in 2015.

Since the court order has come about, we have also been leveraging existing technologies that are available, and the BEP has introduced a new reader, a mobile app for the blind and visually impaired using—it is free to anyone who wants to download it.

The BEP anticipates that it will also start working on selecting a tactical feature by January of 2015. And that is a priority for this organization.

The ACD has indicated that the next note to be redesigned will be the $10 note. And it should have the new tactical feature and the enhanced security features. The $10 note was selected because it is a transactional note and it is also a low-volume note in terms of production. So we will be able to test and determine how the tactical feature works in circulation.

However, if there is a threat to another denomination, we will change that. But as it stands right now, the next note will be a $10 redesign.

Chairman CAMPBELL. If you could wrap up your testimony, Mr. Felix, your time has expired.

Mr. FELIX. Mr. Chairman, that concludes my remarks about initiatives at the BEP. I will be happy to answer your questions.

[The statement of Director Felix can be found on page 27 of the appendix.]

Chairman CAMPBELL. Thanks. I am sure you will be getting some questions.

Mr. Peterson was named Deputy Director of the United States Mint on January 25, 2011. And before becoming its top executive, he served as the Mint's Associate Director of Manufacturing for 2 years.

Thank you so much for being here. Did you bring any samples? But please, you are recognized for 5 minutes for your testimony.

STATEMENT OF RICHARD A. PETERSON, DEPUTY DIRECTOR, UNITED STATES MINT, U.S. DEPARTMENT OF THE TREASURY

Mr. PETERSON. Chairman Campbell, Ranking Member Clay, and members of the subcommittee, I appreciate the opportunity to appear before you again today to discuss the United States Mint and coin production.

The United States Mint is a vibrant team of 1,700 dedicated men and women. We operate two fiscally separate programs: a circulating coin program; and a numismatic program that includes collectable coins and our precious metal bullion coins.

I last testified before you in November 2012. And I committed then that the Mint would continue to drive costs out of our manufacturing operations. I am pleased to report our results for fiscal 2013.

We shipped 10.7 billion coins to the Federal Reserve, an increase of nearly 18 percent from the 9.1 billion shipped in 2012. The general and administrative costs (G&A) of our circulating coin operations decreased another $4.7 million—7.6 percent—to $56.9 million.

Since 2009, we have reduced the G&A costs of our circulating program by over 42 percent. Now that is real money. That is $41 million of annual G&A expenses that have been eliminated.

In short, our costs are down, and our production is up. These productivity improvements resulted in a $350 million transfer of seigniorage to the Treasury General Fund.

In December of 2012, we provided our first report to Congress detailing the analysis and testing of possible alternative metals for our coinage. Since then, we have tested in much greater detail several promising alternatives. There are several key points to share at this time.

First, the overarching mission of our circulating coin program is to facilitate commerce by minting and issuing circulating coins in quantities that the Secretary of the Treasury determines are necessary to meet the needs of the Nation. As our 2013 results show, the Mint is meeting that mission with a denomination portfolio that generates positive seigniorage.

Second, cash is and will remain an important method for settling financial transactions. In a 2011 survey, the Federal Reserve Bank of Boston concluded that 65 percent of all transactions under $10, and 45 percent of all transactions under $25, were completed with cash.

Third, our report in 2012 concluded that no alternative metal compositions would lower the cost of the penny. And it is highly unlikely that the cost of minting the penny will ever again fall below one-cent.

Fourth, when other countries have made changes to their coinage and currency lineups, a key to the success of the effectiveness of the change was the communications plan that explained the change.

Finally, change in the metallic composition of our coins will affect a variety of stakeholders in different ways. The Mint is actively seeking feedback from the vending, parking meter, coin-operated laundry, amusement, public transportation, banking, and supermarket industries. Our next report to Congress is due this Decem-

ber, and we are committed to providing decision-makers with accurate and timely information.

Our bullion program set a record for the number of ounces sold in 2013. Gold ounces were up 55 percent to 1.2 million ounces. And silver ounces were up 31 percent to 44.6 million ounces.

Our American Eagle Bullion Coins remain the coin of choice for investors around the world. We are pleased that our suppliers have invested in capacity enhancements and that we are able to meet demand without restrictions or allocations.

The United States Mint's commemorative coin program honors people, places, events, and institutions of significance in American history and culture. We have two important and high-profile commemorative coin programs in 2014: the Civil Rights Act of 1964 Commemorative Coin Program; and the Baseball Hall of Fame Commemorative Coin Program. The baseball program features curved coins, the first ever produced by the United States Mint.

The Mint is actively engaged in regular outreach efforts and public awareness events for both programs that include Members of Congress, including John Lewis and full Financial Services Committee Ranking Member Maxine Waters, as well as several Baseball Hall of Fame members.

Mr. Chairman, the United States Mint is a cost-effective, open, transparent organization that is meeting its core mission to produce circulating, precious metal bullion and numismatic coins. I thank you for your interest in our activities. And I am pleased to answer any questions that you may have.

[The prepared statement of Deputy Director Peterson can be found on page 193 of the appendix.]

Chairman CAMPBELL. Thank you, Mr. Peterson.

Next, Lorelei St. James is a senior executive at the U.S. GAO, serving as Director of the GAO's Physical Infrastructure Issue area. In this capacity, Ms. St. James has a wide-ranging portfolio covering issues such as the United States Postal Service, coin and currency—which is why you are here today—VA construction, and maritime infrastructure issues.

There is a little controversy in a few of those areas, but we are not going to talk about those today. We are only going to talk about coins and currency. Thank you so much for being here. You are recognized for 5 minutes.

STATEMENT OF LORELEI ST. JAMES, DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES, U.S. GOVERNMENT ACCOUNTABILITY OFFICE

Ms. ST. JAMES. Thank you. Chairman Campbell, Ranking Member Clay, and members of the subcommittee, I am pleased to be here today to discuss the Federal Reserve's management of the Nation's coin inventory.

At the end of Fiscal Year 2012, coins worth over $40 billion were in circulation. And in 2013, the U.S. Mint produced over 10 billion coins.

My statement today is based on a report that we issued in October 2013. This report reviewed the Federal Reserve's management of the coin inventory and includes recommendations to improve how the inventory is managed.

Within the Federal Reserve, the Cash Product Office, or CPO, manages the Nation's coin inventory, distributes existing inventories of coins, and orders new coins from the U.S. Mint based on a forecasted demand.

In 2009, CPO centralized coin management across the 12 Reserve Banks. Prior to this action, each Reserve Bank managed its own inventory, which sometimes resulted in either too many coins or not enough. This centralized system in part contributed to the 43 percent decrease in coin inventory levels from 2008 through 2012.

Also in 2009, the CPO established national upper and lower inventory targets, which CPO uses to monitor inventory levels. For example, if inventory levels are above the upper target, CPO knows to order fewer coins. And if the levels are below the lower target, CPO may order more. From 2009 to 2012, we found that in most cases, inventory targets were met.

CPO also manages the inventory on a daily basis, determining when to order new coins or move coins from one location to another or both. If there is an insufficient supply of coins to meet demand in a given location, and transferring coins from another location, known as an interbank transfer, would not be cost-effective, CPO orders new coins each month from the U.S. Mint based on a rolling forecast.

In our review, we found that coin inventory costs totaled about $62 million in 2012, and that these costs had dramatically increased by 69 percent since 2008. We found CPO had not done a systematic review to determine why these costs had increased or if they can be reduced. And we recommended that the Federal Reserve direct the CPO to assess these costs.

We also reviewed if CPO was following the key inventory practices we identified for coin management. We found it was substantially following collaboration and risk management, but only partially following key practices in three other areas.

For example, in examining its forecasting model we found it was consistently under-ordering new coins when compared to actual demand, indicating that the forecast may be biased and that the model should be updated to reflect actual demand.

In system optimization, we found that CPO has multiple sources of information, but didn't use this information to optimize inventory management. We recommended that the Federal Reserve direct CPO to establish coin inventory goals and metrics and assess the accuracy of its forecast.

We also discussed potential changes in the demand for currency with Federal Reserve officials. According to them, studies we reviewed, and government banking officials in Austria, Australia, and Canada, any change in the demand for currency will likely be a gradual decline as electronic means of payment increase.

For example, in the United States, the use of debit cards has increased more than any other payment type, about 7.7 percent per year from 2009 to 2012. In 2010, CPO began to develop a long-term strategic framework to be done in phases to consider potential changes in currency demand over the next 5 to 10 years. At the time of our review, CPO had not established a date that the third phase of this effort would be completed.

In summary, we recommended that the Federal Reserve take additional actions to better manage the Nation's coin inventory, and they agreed with our recommendations.

Mr. Chairman, this concludes my statement. I would be happy to answer any questions you have. Thank you.

[The prepared statement of Director St. James can be found on page 201 of the appendix.]

Chairman CAMPBELL. Thank you very much.

Finally, Mr. Andrew Mills is the Director of Circulating Coin at the Royal Mint, University of East Anglia and Cardiff in the United Kingdom. You have been in that position since 2009. And did you bring three shillings and twopence? Oh, you don't do that anymore. All right.

Mr. MILLS. Since 1971.

Chairman CAMPBELL. Yes, I thank you so much for being here. You are recognized for 5 minutes.

STATEMENT OF ANDREW MILLS, DIRECTOR, CIRCULATING COIN, THE ROYAL MINT, UNITED KINGDOM

Mr. MILLS. Thank you. I would like to thank Chairman Campbell and the esteemed members of this subcommittee for inviting the Royal Mint to give testimony on our work to control the cost to produce circulating coins.

Current business-as-usual demand for UK circulating coin is approximately one billion pieces a year. We have a total capacity to make four billion pieces.

The remaining capacity is used to supply struck coin and blanks to overseas central banks and mints around the world. We also supply tooling, metal recovery services, and consultancy to these customers, which is why we describe ourselves as the world's leading export mint.

Over the years, the Royal Mint has developed a number of capabilities that enable us to control the cost of producing circulating coin for our customers. Our armor plating technology replaces expensive solid alloy coins with a mild steel core electroplated with either nickel, brass or copper.

This single layer, or mono-plate, at typically 25 microns, allows for a lifetime in circulation in excess of 20 years. In contrast, multilayer plating has a thin outer layer of only 6 to 9 microns that can wear through in as little as 5 years in circulation, exposing the underlying copper layer.

Our new award winning Integrated Secure Identification Systems (iSIS) technology for the first time brings a machine-readable high-security feature to our cost-effective armor plated coins that up until now was only available in bank notes. iSIS coins can be read at over 4,000 coins a minute, and provides a definitive binary authentication. It is either a genuine coin or it is a counterfeit.

Unlike today's electromagnetic sensing that has a wide acceptance window and varies over time, the high security iSIS additive is co-dispositive in the armor placing layer, and is therefore constantly exposed to be read as the coins wear in circulation.

I will now summarize the cost controls that we have implemented on behalf of Her Majesty's Treasury since decimalization in 1971. To give a perspective of the scale of the cost savings, I have

calculated the metal saving of each of these changes since they were made using London Metal Exchange prices on the 31st of March 2014.

The current exchange rate is on the order of $1.65 to 1 pound sterling. There have been four types of programs that have controlled the cost of U.K. circulation coins. The first, demonetization, the decimal half penny, ceased production in 1984, and in the last year of full issuance, 191 million were manufactured, at a metal cost of 1.4 million pounds. This cost then became nonrecurring.

Secondly, the conversion of solid alloy coins to armor plated coins. In 1992, the 1p and 2p coins were converted from bronze to armor copper plated steel. The metal cost savings since this change has been 281 million pounds.

To provide a sense of the scale difference between U.S. demands and that of the United Kingdom, and comparing the U.S. $0.01 to the U.K. 1p, since 1992 we have made 13 billion 1p coins and the U.S. Mint has made 190 billion one-cent coins.

In 2009, Her Majesty's Treasury announced that the 5p and 10p would be converted from copper nickel to armor nickel plated steel. And this change has saved 21 million pounds in metal costs.

Reduction in coin sizes has also occurred. In 1992, the copper nickel 5p and 10p were reduced in size. These changes saved 135 million pounds in metal costs. And in 1997, a smaller 50p was introduced, saving 29 million pounds.

Finally, the proactive replacement program. The 2012 Autumn Statement announced the active withdrawal of the copper nickel 5p and 10p coins for circulation. In the first year of operation, it delivered 15 million pounds of benefit to Her Majesty's Treasury, and indeed the U.K. taxpayer.

The U.K. coinage model ensures that new coins are not struck when surface coins are held by the cash industry members. Surface and deficit cash industry members trade coins between one another on a weekly basis.

Overall costs are also optimized by using an annual forecasting process agreed in the market between UK Payments, an industry body that represents retail banks and cash handling companies, the Royal Mint, and Her Majesty's Treasury.

For these changes to take place, I cannot emphasize enough how important stakeholder engagement is from early on in the process. We have regular dialogue with stakeholders that represent different facets of the coin acceptance industry, including vending, parking, amusements and retail.

We also have close working relationships with major coin mechanism and sorting companies that provide equipment in the United Kingdom. And this is in addition to concert with institutions such as the Royal National Institute for the Blind.

In closing, the Royal Mint has significant expertise and experience in this field. And iSIS provides a novel, high-security feature in lower-cost plated coins. We will be delighted to work with stakeholders here in the United States.

Thank you once again for inviting me to give this testimony, and I welcome any questions that you may have.

[The prepared statement of Director Mills can be found on page 35 of the appendix.]

Chairman CAMPBELL. Thank you. Thank you all very much for your testimony. I will now recognize myself for 5 minutes for the first series of questions. And my first questions will be to you, Mr. Mills.

You just described a lot of changes over a period of time from eliminating a coin, the halfpenny, to changing the composition and even the size of various coins. And you mentioned stakeholders, vending, parking, et cetera. And all the savings to the Treasury, and up here, we are certainly interested in saving money to our Treasury.

But there is the question—what kind of disruption did this cause? How difficult was it for the private sector to accommodate all of those various changes in coin type, composition, and size?

Mr. MILLS. Yes. Thank you very much, Mr. Chairman.

Our aim in any of these changes is to provide as little disruption as possible, be that for people within the industry or the general public. And I think a good measure is our most recent change, which was the introduction of the nickel plated steel 5p and 10p coins.

We engaged with stakeholders very thoroughly. A major stakeholder is the Automatic Vending Association in the United Kingdom, which represents much of the vending industry. And it was on their advice that indeed we took 2 years to introduce these new coins from the point of the announcement in September 2009 to their final introduction in January 2012.

Chairman CAMPBELL. Was that to give them time to—

Mr. MILLS. Absolutely. It was absolutely to minimize the impact on their members in terms of making sure that the software changes that were necessary could be carried out with incurring very little or no additional cost.

Chairman CAMPBELL. How do you and how does everyone deal with it if you have two different coins in circulation at the same time that are of completely different size or composition but they have the same nominal value?

Mr. MILLS. Yes, thank you. The change to the 5p and 10p, in fact as far as the general public is concerned, they would really tell very little difference. They are the same diameter and look, for all intents and purposes, identical to one another, apart from the fact that one is magnetic because it is based on 94 percent, 96 percent steel, and the other one is non-ferrous so it is non-magnetic.

One of the big learnings from engaging with the vending industry is that they prefer co-circulation to occur for the shortest possible time. So the fewer coins their machines accept and have to recognize, the better that is for them and their members. That is why we introduced the proactive replacement program to actively withdraw the copper nickel 5p and 10ps to the benefit of the vending industry.

Chairman CAMPBELL. All right. Thank you.

Mr. Peterson, Mr. Mills described a whole bunch of composition which is way over my very limited chemical and metallurgy knowledge. Is there stuff they are doing in the U.K. that we are not but we ought to be or should be thinking about doing?

Mr. PETERSON. Sir, could you repeat the last part of that question?

Chairman CAMPBELL. As far as some of the composition things that Mr. Mills talked about in the U.K., are we doing those things here? Or should we? Or have we decided not to?

Mr. PETERSON. Absolutely. In 2011, the United States Mint began an active research and development program to explore alternative metals for our coinage.

And really, on the metallurgy piece, there are four metals on the periodic table of the elements that are in play. These are zinc and iron in the form of steel, lead, and aluminum.

We are not going to make our coins out of lead, and aluminum is a very difficult metal to work with. So really, we are down to zinc and steel that are in play.

Chairman CAMPBELL. Okay. Thank you.

Ms. St. James, when you look at the millennial generation, they use physical currency less than Mr. Clay and I do. And particularly coins. Is the Federal Reserve—are they anticipating, are they looking at all this sort of thing in terms of what impact that has on physical currency?

Ms. ST. JAMES. In their strategic plan that they have, that they started in 2010, they are looking at and trying to better monitor trends.

And as I discussed in my written statement, with the countries that we talk to, Australia to Austria and Canada, they believe that there will be a gradual decline in currency, but there will still be what is called the unbanked. There will still be a portion of society who will always use coins.

So one of the reasons why we made the recommendations to the Fed was for them to have more data to better monitor what was happening and so they could see those changes in demand with more fidelity than they do right now.

Chairman CAMPBELL. Thank you.

I had questions for Mr. Felix, but I will have to get to them in the second round.

I do have with me a $20 billion Zimbabwe note, which I always carry around to prove that it is really not about the paper. It is what stands behind the paper that is the most important.

But with that, my time has expired, and I will yield 5 minutes to the ranking member, the gentleman from Missouri, Mr. Clay.

Mr. CLAY. Thank you, Mr. Chairman. Perhaps I can borrow $10 billion from the $20 billion.

Chairman CAMPBELL. I actually have—this is $20 billion. I have a $10 trillion note as well.

Mr. CLAY. Mr. Felix, a White Paper was issued by the BEP in 2013 which reported that reinjured notes with tactile features designed to provide meaningful access to the blind and visually impaired won't be available for circulation for another 6 years. Can you talk about the process associated with designing and issuing the new notes? And help us understand why it will take 6 years?

Mr. FELIX. Thank you, sir.

The reality is that we design currency to deter counterfeiting. And so, the longer lead time for our currency design is to get the overt and covert features in the currency as we introduce the new currency design. And as we introduce the new currency design, we

also intend to apply the tactile feature, as the court had given us the opportunity to introduce it at the new design.

So the longest lead time in that is not so much tactile features, but acquiring classified central bank features and being able to deploy them into the bank notes, as well as the security features that people can just look at and determine whether or not it is authentic or not.

Mr. CLAY. And now, there is an app that the blind can use that will tell you the denomination of the note?

Mr. FELIX. Yes. There are several options. We have introduced a downloadable app on the Apple iPhone that you can use.

Right now, in conjunction with the Department of Education, they have introduced one Apple/Android. And of course, we will also be distributing a portable currency reader for anyone who is eligible. And they can also get that through a collaboration with the Library of Congress.

Mr. CLAY. Thank you for your response.

Mr. Peterson, how viable is plated steel as an option for replacing the current composition of U.S. coinage?

Mr. PETERSON. Mr. Clay, as I mentioned, zinc and steel are currently in play and we are analyzing several different compounds of steel. And we are doing a very detailed test regimen on this.

We have made millions of plated steel trial coins. We understand the striking pressure, the tonnage that we need to use on our presses, and how long the dyes will last.

We take these coins and tumble them in a tumbling chamber to simulate a lifetime of corrosion and wear. We add a little saline solution to simulate perspiration so that we have a good feel as to how long these coins will be viable for in the long term.

And we know that our friends in Britain use plated steel. Our friends in Canada use plated steel. Steel is a viable option.

Mr. CLAY. Are you concerned that Canadian ownership of the plated steel patent would add additional cost to the production of plated steel coins?

Mr. PETERSON. I wish we had gotten the patent, but we didn't. But our price quotes with the Royal Canadian Mint are fair, and I am not concerned that we are going to have an issue with that patent.

Mr. CLAY. Thank you for that response.

Ms. St. James, what are the next steps the Federal Reserve should be taking to better manage coin inventory?

Ms. ST. JAMES. We were quite surprised when we looked at cost, that between 2008 and 2012, the cost of the management of the coin inventory had increased by 69 percent. So we naturally asked them, why has it increased so much? And they said direct costs and support costs have gone up.

But beyond knowing that is what made up the 69 percent, they didn't really have specific answers for why those costs had increased. And they had not looked at them. So we recommended that they really do a good analysis of where they could reduce those costs.

Mr. CLAY. Thank you for that response.

Mr. Mills, what steps has the Royal Mint taken to reduce coin production costs? Can you talk about that 20-year lifespan of the coin?

Mr. MILLS. Yes, certainly.

There are several types of plating technology available for Circulating Coin. And the only one that has a license fee is the Canadian technology. So our armor technology is not only license-free, but we would say also has better duration in circulation.

We apply a single layer of 25 microns in nickel-plated coins. Our independent testing in fact carried out here at the Fraunhofer Institute in the United States shows that on average, coins wear at a micron a year. So with 25 microns, you should get at least 25 years life.

With the outer layer of multiple plating technology, you only get 6 microns to 9 microns. That means you are going to be paying a license fee, and potentially replacing your coins every 6 to 9 years.

Mr. CLAY. Thank you. And I yield back.

Chairman CAMPBELL. The gentleman's time has expired. Thank you.

And now, we will recognize the chairman of the House Committee on Agriculture, the gentleman from Oklahoma, Mr. Lucas, for 5 minutes.

Mr. LUCAS. Thank you, Mr. Chairman. And I would note to all my colleagues that the things you work with not only just represent a medium exchange, a store of value, but as we discussed before in this subcommittee, a very important statement about our society.

In the case of paper money, the artistic nature, the scientific nature in the United States for 150 years—coinage, of course, 2,500 years of recorded history is documented in those things.

So it is not just a subject matter of immediately what is in your pocket change. But it is a statement that will be left for millenniums to come. That said, for a moment I would like to visit with the panel about just a variety of small issues.

Ms. St. James, in the examination of the circulating cash situation and the way the Federal Reserve handles that, I have read somewhere, and maybe you can confirm or deny this, but the 50-cent piece literally—do we have more coming back into the banks than we have going out?

And Mr. Peterson, could you touch on this for a moment about the nature of the 50-cent piece? Is it an example of a coin that in effect doesn't circulate at all anymore once you get past the numismatic community?

Mr. PETERSON. The 50-cent piece is not ordered by the Federal Reserve. So, the United States Mint hasn't made them since 2006.

Mr. LUCAS. For general circulation. So that answers the question.

Mr. Felix, what percentage of your printed currency that you deliver to the Federal Reserve is $100 bills, approximately?

Mr. FELIX. So the order change—

Mr. LUCAS. And I know it varies from—

Mr. FELIX. Right.

Mr. LUCAS. —cycle to cycle. Just round numbers.

Mr. FELIX. The vast majority of notes in terms of value is circulated outside our borders. Over 50 percent are in $100 bills. So

it is about—of the $1.2 trillion in circulation, more than half in value are hundreds. But we typically we produce about 1.5 billion a year in hundreds.

Mr. LUCAS. And of your overall production you mentioned—

Mr. FELIX. —around seven.

Mr. LUCAS. Exactly. And of your overall production, you mentioned the fact that by law you were not authorized to change the design on the $1 bill. What percentage of your average annual run, round numbers, are ones?

Mr. FELIX. We do about a billion as well.

Mr. LUCAS. Okay.

Mr. Peterson, since we have not for a number of years had orders from the Fed for circulating 50-cent pieces, for a moment what percentage of, in round numbers, of your overall coin production are 1-cent pieces and 5-cent pieces, those two lower denominations on the—

Mr. PETERSON. In 2013, we manufactured 10.7 billion coins, with 6.6 billion of those, about 60 to 65 percent, pennies, and 1.1 billion nickels. So it's very concentrated toward the pennies and nickels.

Mr. LUCAS. So in both cases, at Engraving and Printing and at the Mint, a substantial portion of your production is the lower denomination, whether it is $1 bills in paper or currency or the 1-cent and 5-cent pieces in coin.

Mr. PETERSON. Correct.

Mr. LUCAS. By the way, on a slightly different note, Mr. Peterson, one of your predecessors began the process of an inventory of the various things within the Mint's possessions.

And while your institution is not quite as old as Mr. Mills' institution, which predates you by hundreds of years, nonetheless you are one of the oldest institutions of the Federal Government.

And not only the good work you do on the day-to-day basis in the numismatic programs, but the historic property and the historic record, is a voice of great interest to the numismatic community.

I don't know whether you can answer this question today or not, but I would ask if you are aware of that effort to create that master inventory of all your assets, some of us would define as treasures. And if you are not up to where at a particular moment I would appreciate a response in writing later about just what the status of that treasure catalogue is, as some people would describe.

Mr. PETERSON. Absolutely. The Mint is one of the oldest institutions in the United States, 222 years old, a venerable institution. And we do have many heritage assets at each one of our facilities.

After the prior testimony we hired a curator and we have catalogued our heritage assets, and we are ready to share that information.

Mr. LUCAS. That is a very important thing because that is of great interest to a good many good people around the country and around the world. And as you describe them, heritage assets, some of them literally go back to the very beginning.

That said, I would just note to my friends at Engraving and Printing and at the Mint, if we continue on the monetary policies we have with a regimented inflation factor built in, at some point we have to assess the viability of those lower denominations. We

don't make half-cent coins anymore, as the Mint did for 60-some years.

I believe the original statute actually allowed for a denomination referred to as mills/1,000 for the dollar. We have never used that. At some point, we may have to assess in a practical way what we make and why we make it and how that impacts commerce.

And with that, Mr. Chairman, I yield back.

Chairman CAMPBELL. And I thank the gentleman for yielding.

And now, we will go to the gentleman from South Carolina, Mr. Mulvaney, who is recognized for 5 minutes.

Mr. MULVANEY. Thanks very much, Mr. Chairman.

I want to continue there on what Mr. Lucas was talking about because we hear a lot of discussion about getting rid of the lower denomination coins. We have done that in the past.

And I just wonder if commerce isn't changing to where smaller denominations are actually going to become more and more relevant as we go through. I think immediately of online transactions. I am not willing to pay $0.99 to buy a song, but I might pay 1/20th of a penny to listen to it one time.

Is there a way for currency to do that? Is there a way for hard currency to deal in smaller and smaller denominations?

Let's ignore—for instance, the larger and larger denominations, but start talking about smaller and smaller. Is there a way to do that with hard currency? Mr. Peterson?

Mr. PETERSON. As I mentioned in my opening statement, many, many transactions still occur in cash around the country. Cash enjoys the advantage. It is one of the lowest cost ways to conduct a transaction and it is confidential, and so the American public will probably want to continue to use cash for some percentage of their transactions.

Our job at the Bureau of Engraving and Printing and the Mint is to facilitate commerce with the trusted coins and currency. And we know that millions of transactions happen every single day using cash. And it will continue to be like that.

Mr. MULVANEY. Okay. I am not sure if that answers the question about smaller and smaller denominations.

Let me ask then—let me talk about what the reason I asked the question is: I would be curious to know your thoughts on the crypto-currencies, on bitcoins specifically so the other currencies that are out there.

I am sitting here reading a blog, I guess, Mr. Peterson, from your former boss, Edmund Moy, who just recently wrote something on bitcoin. And he closed the article by saying that bitcoin and the ideas behind it will be a disrupter to the traditional notions of currency. But in the end, currency will be better for it.

Have you all given any thought—and I will throw this open to the group, as to where your various organizations and institutions are on the role that online currencies, that crypto-currencies play in this particular role, in the functioning of commerce?

Mr. Mills, I would be curious to know what the Europeans think about it as well. But, Mr. Felix, you look like you—

Mr. FELIX. I was going to say that is really a province for the Federal Reserve, the central bank—

Mr. MULVANEY. Okay.

Mr. FELIX. —and they do tend to look at some of those things more than the operational organizations of the United States Government.

Mr. MULVANEY. All right. But it would impact you directly though, right? Is it competition? Is it a complement? How do you—has the BEP taken a look at it? Do they have an official position on it? Or they just haven't done that yet?

I am just curious. I am not trying to bait anybody. I know it is such a new topic that a lot of folks might not have a position on it yet.

Printing and Engraving does not. Does the Mint? No?

Mr. PETERSON. At the Mint, our focus is on producing United States coins. And the other alternative vehicles—

Mr. MULVANEY. Doesn't factor in?

Mr. PETERSON. No.

Mr. MULVANEY. Mr. Mills, has the British government taken a position on it?

Mr. MILLS. Again, we at the Royal Mint act as agents for Her Majesty's Treasury. We don't set policy.

Mr. PETERSON. Okay.

Mr. MILLS. So pretty much as Mr. Felix said then, that is not within my knowledge or my ability to answer, I am afraid.

Mr. MULVANEY. All right.

Ms. St. James, I have asked everybody else. Maybe this is the wrong—apparently the wrong group to ask this question.

Ms. ST. JAMES. They are correct in that it is the Federal Reserve here in the States—

Mr. MULVANEY. Okay.

Ms. ST. JAMES. —the Federal Reserve policy to make that decision. And they are looking at electronic payments and the increase in those electronic payments. Interestingly, the electronic payments have seemingly impacted checking more than the demand for currency.

Mr. MULVANEY. Let me ask—Mr. Peterson, let me close with this, see if I can keep it germane to why you all are here today.

Is there a way—is it possible for traditional hard currencies to deal with transactions at a small fraction of a penny?

Mr. PETERSON. I am sure in an electronic world, there might be. But practically, for the United States Mint to make coins that are less than a penny, I don't see that as part of our future.

Mr. MULVANEY. And that would be the same for the British government, Mr. Mills, do you think?

Mr. MILLS. Again, not wishing to sound boring, I would have to defer to my colleagues in Her Majesty's Treasury or the Bank of England.

Mr. MULVANEY. Listen, I have been to a lot of meetings. This is by far not the most boring I have been to. I can assure you of that.

So thank you, Mr. Chairman. And thank you to the panel.

Chairman CAMPBELL. Thank you.

And just arriving—you are—okay. The gentleman from Ohio, Mr. Stivers?

Mr. STIVERS. Perfect timing.

Chairman CAMPBELL. Perfect timing is recognized for 5 minutes.

Mr. STIVERS. Thank you, Mr. Chairman. I really appreciate you holding this hearing on important issues. And I have a few questions related to coins.

The first question is for Director Peterson. Can you assure us that the Treasury has not and will not make changes to our circulating coins that would increase the cost to produce them?

Mr. PETERSON. Congressman, Congress controls what the composition of our coins is, what the diameter is, and what the weight is. And so we will continue to make the coins that are authorized for us to make today, the penny, nickel, dime, quarter, and half-dollar coins.

Mr. STIVERS. Great. And can you update us so you can maybe refresh my memory? As I recall, 2½, 3 years ago, Congress mandated the U.S. Mint to do a study on what was in coins, how coins were produced. You produced an initial report on or about the deadline of 2013, the end of 2013, as I recall.

Mr. PETERSON. In December of 2012, yes.

Mr. STIVERS. December 2012, I'm sorry. And then you said you needed more time. And then I saw another report and I met with you subsequently and you said you needed a little more time. Can you update us on the status of those efforts?

Mr. PETERSON. Absolutely. I mentioned before that we are analyzing multiple formulations of zinc and steel. Both appear to yield some cost savings. And we are putting the finishing touches on what those cost savings would be so that we can provide the right information in our next report to Congress, which will be in December of this year.

Mr. STIVERS. So we will be a full 2 years after the initial required timeframe for Congress. And will we have any final results by then, when we are 2 years late?

Mr. PETERSON. Yes. Our next report is in December. And we will fully flesh out all the various costs to produce both the zinc and the steel coins. We are also beginning to look at a stainless steel alternative and other alternatives that are various ratios of copper, zinc, and nickel.

Mr. STIVERS. Thank you. Are you familiar with the Navigant Study from 2 years ago? It said that the United States could save over $2 billion over a decade if just the nickel, dime, and quarter were made of plated steel. And you just referred to stainless steel.

I would just remind the entire audience that stainless steel costs almost 3 times what plated steel costs. And Canada made the switch to plated steel over 10 years ago.

Do you guys at the Mint think the Navigant Study was correct? And do you think there would be more savings if we included the penny in that since it is our largest circulating denomination?

Mr. PETERSON. Our report 2 years ago showed that there were no alternative metals that would lower the cost of the penny. And so the penny is not part of that, and there would be no benefit to shift to steel.

On the nickel, dime, and quarter, there are cost savings possible with steel coins. And I testified previously that obviously our friends in Great Britain use plated steel. Our friends in Canada use plated steel. Steel is a viable option for United States coinage.

Mr. STIVERS. Thank you. And I appreciate you commenting on plated steel because your report as of 2012 when I looked at the price and we did some work, and I have met with you since, it sure looked like you were not using plated steel, not using cold rolled steel. It looked like you were using a stainless steel price. And if you looked at the cold rolled steel price, you would see a substantial savings on the penny.

I would ask you to just go back and look at that. I want to ask you in a formal setting, I know I have asked you in my office, but I would ask you again to go back and take a look at that again.

So, Canada and the United Kingdom and several other countries have already made the switch to lower-cost coins over the last 20 years, in fact the U.K. first and then Canada. Why has the United States been lagging in that, Mr. Peterson?

Mr. PETERSON. We were just given authority to go conduct research and development in December of 2010. We ramped up that effort in 2011 when we established a secure research and development laboratory at our Mint facility in Philadelphia. We analyzed 27 different alternative compositions in 2011 and 2012.

We put out our first report in 2012, saying that there was a smaller number, four or five possible alternatives, that we needed to conduct further in-depth research on to confirm the actual cost of making the coins out of those materials. And that is what we are doing right now and what we will report out on in December.

Mr. STIVERS. Thank you. I would just urge you, and I have just a few seconds left, to move as fast as you can on that, because what we will need to do if we are going to allow the vending coin industry time to put this in their capital replacement costs, is to make an announced change and then phase that in over time, because those folks deserve an opportunity to have it phased in.

That is what Canada did. If we phase it in, it will work so much better, because their capital replacement cost is an average of 100 percent replaced every 5 years.

So the sooner we can announce the change and then continue to work toward it, the better it will be. And I think that industry would like to work with you. And they deserve the ability to have that phased in over a reasonable timeframe.

Mr. PETERSON. Agreed.

Mr. STIVERS. Thank you, Mr. Chairman. I yield back my nonexistent time. Thank you for your indulgence.

Chairman CAMPBELL. Thank you.

I think Mr. Clay and I have a couple more questions, so we will do sort of a second round. There are only two of us in the round. And then, we will let you all go back to what you actually do all day.

Okay. I yield myself 5 minutes.

Let me go now to Mr. Felix and understand, so we, Congress, said you can't alter the dollar note?

Mr. FELIX. That is correct. It was done—I think it was done when Mr. Colby chaired the Appropriations Committee. There was language in there that says we cannot make any changes at all to the $1 note.

And I think it is in part—this is when we were beginning our redesign of all notes. And it is in legislation that is continued on to this day.

Chairman CAMPBELL. But you would want to? I would presume that counterfeiting is less of a problem with the dollar. If you are going to counterfeit, make big money.

So left to your own devices, you would like to change the dollar note?

Mr. FELIX. We are perfectly comfortable because the counterfeiter didn't get that big return, if you will, on counterfeiting a one.

Chairman CAMPBELL. Are there counterfeit dollar notes out there? Have there been? Or is it just kind of a—

Mr. FELIX. You are talking about ones?

Chairman CAMPBELL. Just yes, on a one, I'm sorry, yes.

Mr. FELIX. Very few.

Chairman CAMPBELL. Okay.

Mr. FELIX. Very few.

Chairman CAMPBELL. And fives, tens? Because you are changing the ten, you said.

Mr. FELIX. Right. Typically the biggest issue with the fives is actually people would erase—they would take the five and bleach it out and print 100 on it. And the reason for that is they will go to places that use the marker. And it will give an indication of real currency because it is real currency paper.

And that is one of the reasons why we made a preemptive change in the five. And so we have in the watermark of the five, the number five in it.

Chairman CAMPBELL. Okay. So this is a $100 bill, which is your latest iteration. Is that correct?

Mr. FELIX. Yes, sir. That is correct.

Chairman CAMPBELL. Of bill of any denomination this is the latest iteration. So this is what you will be transitioning, 20s, 50s, 10s too?

Mr. FELIX. That represents the last of our—what we call our next-gen series. We begin to embark—we will be starting with the ten, as I said in my testimony. And it will be completely different. It may in fact have a higher order of technology in the bank notes. So that actually represents the closing of the next-gen series.

Chairman CAMPBELL. The next-gen?

Mr. FELIX. The end of that series, yes.

Chairman CAMPBELL. The end of that series?

Mr. FELIX. The end—

Chairman CAMPBELL. So the ten will be a new series—

Mr. FELIX. That is correct.

Chairman CAMPBELL. —from this one? Okay.

So the dollar, single dollar, that you are not changing, does it cost less to make those than it cost to make these or the new ten because it doesn't have all this anticounterfeit stuff?

Mr. FELIX. It cost us typically about $0.04 to make a $1 note because it doesn't have those security features.

Chairman CAMPBELL. Right.

Mr. FELIX. What we have just introduced, a new technology enhancement, the BEP, where it will yield even 15 percent more savings because we are producing—we currently produce them in 32

notes per sheet. And starting this year, we will be producing them at 50 notes per sheet for an incredible yield. And so, the price will go down below that even further.

Chairman CAMPBELL. Okay. But—

Mr. FELIX. But it does not have—

Chairman CAMPBELL. So, it cost $0.04 to make that. What does it cost to make this?

Mr. FELIX. About $0.12.

Chairman CAMPBELL. Okay. A lot more. Okay. Got you. All right. Thank you.

Ms. St. James, you talked about how the Federal Reserve—that it costs 67 percent more than it did a few years ago to do what?

Ms. ST. JAMES. Their cost to manage the coin inventory went up by 69 percent between 2008 and 2012.

Chairman CAMPBELL. So, not to make it. We are talking about to manage the coin inventory?

Ms. ST. JAMES. To manage the coin inventory.

Chairman CAMPBELL. Why? What did they spend—is there more or less physical money in circulation than there was then over that period?

Ms. ST. JAMES. Part of the problem is that they were monitoring a cost figure that included currency management costs plus coin management costs. They never took a separate look at what it cost to manage coins.

But overall, currency, both note and coins, that cost increased by 23 percent, and when we took out the coin inventory costs, that is the 69 percent increase from 2008 to 2012.

Chairman CAMPBELL. Okay. This is something we will have to look into some more.

We did ask the Federal Reserve to be here. They declined, saying that there was an FMOC meeting within 2 weeks and that they couldn't show up because of an FMOC meeting in 2 weeks.

Although clearly what we are discussing has nothing to do with monetary policy in the broad sense of M1 and M2 monetary policy. But they declined to be here for this hearing. There are a lot of questions I would like to ask them on the basis of that.

Thank you very much. My time has expired. I yield to the ranking member of the subcommittee, Mr. Clay, for 5 minutes.

Mr. CLAY. Thank you, Mr. Chairman.

Ms. St. James, the Federal Reserve's 2013 annual report found that Reserve Banks hold roughly 1.4 billion $1 coins, which accounts for more than 40 years of supply at current levels of demand. Given this, to what extent can the increase in coin management costs be attributed to managing dollar coin inventories associated with the dramatic increase in dollar coins as part of the Presidential $1 Coin Program?

Ms. ST. JAMES. The cost increase that we referred to does not include the dollar coin. It only includes pennies, nickels, dimes, and quarters.

Mr. CLAY. How much do you anticipate the Federal Reserve will have to spend just to manage the dollar coin inventories over the next 40 years?

Ms. ST. JAMES. We don't have that cost at the—

Mr. CLAY. Could you supply this committee with an estimate or the cost—

Ms. ST. JAMES. Yes.

Mr. CLAY. —of what you think it would be?

Ms. ST. JAMES. Certainly.

Mr. CLAY. Thank you.

Mr. Peterson, can you discuss how you have been able to increase production efficiency to bring down per unit costs of producing the penny and the nickel in recent years? Do you anticipate achieving further such efficiencies in future years?

Mr. PETERSON. Absolutely. I have testified before that our plant manager in Denver came to us from General Motors. Our plant manager in Philadelphia came to us from Ford Motor Company. I spent 11 years with General Electric.

We know how to take costs out of our manufacturing operations. The short answer is, we don't swing for the fences. We try and hit singles every day. And those little wins add up over time.

We have renegotiated contracts to get costs out year-over-year on some of our recurring contracts. We have invested in capital equipment for the HVAC systems, the water treatment systems, the lighting systems, and they reduce our utility costs year-over-year.

We have shifted our manufacturing operations in Denver and Philadelphia to two-shift operations, and they run Monday through Thursday. And we turn down the furnaces on Friday, Saturday and Sunday so that we can reduce our utility expenses.

There is an inherent seasonality to coin demand. In the build-up to Memorial Day, coin demand goes up in March, April, and May, and then again in October and November before the holidays. And the coins flow back into the Federal Reserve in January and February and over the summer.

And so, we have smoothed production. We look at what the 12-month forecast is and we staff up for those levels. And we make the same number every month. And if there is a peak, we add temporary workers to make that peak demand.

Those kinds of cost reductions are what we are doing every single day. And we are going to continue those.

And the 42 percent cost reductions I mentioned in my opening statement in G&A expenses over the last 3½ years, are among our proudest accomplishments at the United States Mint.

Mr. CLAY. Thank you so much for your response.

Mr. Chairman, I have no other question. I yield back.

Chairman CAMPBELL. Thank you.

Our final set of questions will be a second round from the gentleman from Ohio, Mr. Stivers. You are recognized for 5 minutes.

Mr. STIVERS. Thank you, Mr. Chairman. I really appreciate that. My first question is for Ms. St. James.

The GAO—the ranking member was just talking about the costs with Director Peterson of how we produce coins. And I would like to note that they have very extensive real estate in downtown Denver and in Pennsylvania, the very old, aging plants and aging equipment.

And the way I understand it, Mr. Peterson just basically said they fire their furnaces for 4 days and then turn them way down for 3 days, and then they start over and do a 4-day week again the

next week. Could we save money by modernizing our equipment, our plants, and our production techniques?

Ms. ST. JAMES. I think that is probably a question better directed to the Mint.

Mr. STIVERS. Director Peterson?

Mr. PETERSON. So yes, our Denver Mint was built in 1904, our San Francisco Mint in 1937, and the West Point Mint in 1938. And our newest Mint was Philadelphia in 1968.

I did serve in the Navy and I know we get to retire our aircraft carriers after 50 years. And so, what we want to do in those facilities is look at our capital expenditures, look at what the buildings need, look at what equipment needs to go inside the buildings.

And again, in the manufacturing cost reduction mode, we want to preserve flexibility in the manufacturing operations so that we can move products from one site to another back and forth. We don't know what the future will hold as to what materials we make our coins out of and what denominations we will be asked to make.

And so preserving and expanding the manufacturing—

Mr. STIVERS. And all three of those facilities are in downtowns, aren't they, in pretty expensive real estate?

Mr. PETERSON. West Point is on the outskirts of the campus of the military academy on the Hudson River.

Mr. STIVERS. If you were able to sell the real estate and recoup the profits to build newer facilities in places that might be a little less expensive real estate, and buy more modern equipment—I guess my question is, have you done an analysis of that in any of your plants?

Because if your newest plant is 50 years old and your oldest plant is 106 years old—

Mr. PETERSON. One hundred ten.

Mr. STIVERS. I'm sorry, 110 years old. I didn't want to short them. Have you done that analysis?

Mr. PETERSON. No, we have not done an analysis to go out and look at what the real estate markets are. I will say that these sites are heritage assets that Mr. Lucas asked about earlier in the hearing. They are on the register of historic places in the cities in which they exist.

Mr. STIVERS. And I am sure they are very historic and beautiful. But in the end, we have an obligation to taxpayers to make our coins as efficiently as we can.

My next question is for Mr. Mills. Having gone through the process of taking a lot of costs out of your coins and now being a mint that makes coins for how many nations?

Mr. MILLS. In total, we say we supply around 60 other nations, depending on the year.

Mr. STIVERS. So you have been able to make coins for 60 other nations and continue to do research and development, buy new equipment because you have the flow-through. Of course today, I think the United States only makes coins for one country.

Tell me about your experience of how you have been able to take so much cost out of your coins.

Mr. MILLS. Yes. Thank you, sir.

As I said in my testimony, I guess it is in some fundamental areas. One has been changing the metal composition, and by and

large that has been changing from solid alloys, which are obviously relatively expensive if you look at the price of the nickel at the moment. It is trading, I checked this morning, at about $18,000 a ton versus steel in Europe is trading at about $900 a ton.

So with a nickel plated coin, you are talking about taking over 95 percent of cost—

Mr. STIVERS. And do you buy your steel at $900 a ton?

Mr. MILLS. That is the sort of price in Europe at the moment.

Mr. STIVERS. So the study in 2012 that the U.S. Mint did claimed steel was $2,100 a ton. Clearly, that is not the same composition steel that you buy.

Mr. MILLS. I don't know the exact—I don't know anything about the specification of steel—

Mr. STIVERS. In the whole world, steel was trading at $900 a ton at that point too. So it has been pretty flat. And I don't mean to cut you off, but I only have 27 seconds left.

If the United States were to enter into an agreement with the Royal Mint and ask you to make the penny for us, would you have any idea what you could make it for?

Mr. MILLS. Looking at the work we have done, I think it would be very difficult to have a U.S. penny that would be in positive seigniorage.

Mr. STIVERS. But could you make it for less than $0.02?

Mr. MILLS. I would have to look at it more closely. I think it is a tough job.

Mr. STIVERS. Thank you. My time has expired again. That keeps happening to me.

Chairman CAMPBELL. Thank you—

Mr. STIVERS. Thank you, Mr. Chairman.

Chairman CAMPBELL. —Mr. Stivers.

I do have to say I miss the halfpenny and the shilling. Of course, my taxes aren't paying for them.

I would like to thank our witnesses for their testimony today.

The Chair notes that some Members may have additional questions for this panel, which they may wish to submit in writing. Without objection, the hearing record will remain open for 5 legislative days for Members to submit written questions to these witnesses and to place their responses in the record. Also, without objection, Members will have 5 legislative days to submit extraneous materials to the Chair for inclusion in the record.

And with that, thank you all. This hearing is adjourned.

[Whereupon, at 12:45 p.m., the hearing was adjourned.]

A P P E N D I X

June 11, 2014

Fitzpatrick Opening Statement

I first want to thank Chairman Campbell and Ranking Member Clay for holding this very important and timely hearing today. I would also like to thank the witnesses for taking the time to be here before us today, especially you, Mr. Mills, for making the long trek from the UK.

I am particularly happy you are here today given that maximizing efficiencies in our currency system is an easy way to achieve billions of dollars in saving to the government and, more importantly, the taxpayers. The U.S. has one of the smallest denominations of paper currency among the major economies of the world. Many nations have modernized their low denomination currency and achieved major savings, something the British Royal Mint accomplished decades ago. For more than 20 years and with ten different reports, GAO has recommended Congress do the same by replacing the dollar note with a dollar coin, realizing billions in savings. As you may know, I have introduced the COINS Act that would enact GAO's recommendation. The most recent GAO Report estimated the taxpayers' benefits of making the switch, conservatively, at $4.4 billion over 30 years, while other economists have put that figure at $13.8 billion.

For the past few decades Congress had heard testimony predicting the imminent demise of cash, given technological advances from credit cards to e-payment systems, and more recently phone apps and Bitcoin. Yet reports from multiple Federal Reserve Banks the last two months stipulate that cash continues to make up the largest share of consumer transaction activity, especially smaller purchases. So, cash is sticking around.

We also repeatedly hear that there are 1.4 billion dollar coins in Federal Reserve inventory, yet few report that the U.S. Treasury continues to report that there are 4.5 billion dollar coins in circulation, more than three times that amount.

At a time of such severe deficits and challenges, achieving $13.8 billion in savings without raising one tax or cutting one program is a serious proposal that deserves consideration by Congress. It's imperative we maximize savings to taxpayers by ensuring our currency is as efficient as possible. I look forward to hearing your testimony.

STATEMENT OF LARRY R. FELIX

Director

Bureau of Engraving and Printing

United States Department of the Treasury

Before the Subcommittee on Domestic

Monetary Policy and Trade

Committee on Financial Services

U.S. House of Representatives

June 11, 2014

Good morning Chairman Campbell, Ranking Member Clay, and distinguished Members of the Subcommittee. Thank you for holding this hearing and inviting me to testify before you today about transformative initiatives underway at the Bureau of Engraving and Printing (BEP).

Mission/Vision

The mission of the BEP is to develop and produce United States currency notes, trusted worldwide.

The BEP is the security printer for the United States Government, and we provide technical assistance and advice to other Federal agencies in the design and production of security documents, which because of their inherent value or other characteristics, require counterfeit deterrence. The BEP also reviews cash destruction and unfit currency operations at Federal Reserve Banks. As a free service to the public, the BEP processes claims for the redemption of mutilated paper currency. Other BEP activities include engraving plates and dies, and manufacturing inks.

The vision of the BEP is to maintain its position as a world-class securities printer, providing our customers and the public superior products through excellence in manufacturing and technological innovation.

Overview

The BEP produces security documents on behalf of other federal agencies; however, our primary product is Federal Reserve notes. The BEP was established and began producing currency in 1862. Authority conferred upon the Secretary of the Treasury under 31 U.S.C. § 321(a) (4) and

§ 5114 allows the BEP to engrave and print currency and other security documents. BEP operations are financed by means of a revolving fund, which was established in 1950 in accordance with Public Law 81-656. This fund is reimbursed through product sales for direct and indirect costs of operations including administrative expenses. In 1977, Public Law 95-81 authorized the BEP to include an amount sufficient to fund capital investment and to meet working capital requirements in the prices charged for products. This eliminated the need for annual appropriations.

The BEP has a diverse workforce, with two facilities operating in Washington, DC and Fort Worth, Texas. Each facility is capable of producing all banknote denominations. On average, the BEP produces approximately seven billion Federal Reserve notes per year. The Fort Worth facility produces 60 percent of the annual production order, while the Washington facility produces the other 40 percent.

The primary reason that Federal Reserve notes are redesigned is to deter counterfeiting. Securing U.S. currency requires strong designs, aggressive law enforcement and an educated public. The BEP works collaboratively through the Advanced Counterfeit Deterrence Steering (ACD) Committee with the Board of Governors of the Federal Reserve System (the Board), the United States Secret Service (USSS), and the Department of the Treasury to improve the counterfeit deterrent features in Federal Reserve notes. The ACD Committee recommends new Federal Reserve note designs to the Secretary of the Treasury.

Currency Redesign Program

In the mid-1990s, the U.S. Government introduced the first major redesign of U.S. currency in 65 years. The design changes were needed to combat the emergence of a new category of counterfeiters who were using computers, scanners, color copiers and other innovative technologies to replicate notes. To stay ahead of the threats to our currency from increasingly sophisticated reprographic technology, the U.S. Government must continuously develop new currency designs with state-of-the-art security features. This means that the BEP must continually develop new security features and currency designs to be ready to respond to developing counterfeiting threats.

On April 21, 2010, the U.S. Government unveiled the last banknote in the most recent currency redesign series, the next generation (NXG) $100 note. The NXG $20, $50, $10 and $5 notes were introduced into circulation in 2003, 2004, 2006 and 2008, respectively. The redesigned $100 note entered circulation on October 8, 2013. The redesign of the $100 note marked the completion of a multi-year initiative to undertake the most ambitious currency redesign in U.S. history. The innovative security features in the new note are the fruit of more than a decade of research and development focused on protecting U.S. currency from counterfeiting. While

retaining the traditional look of U.S. currency, the new $100 note incorporates advanced technology to combat counterfeiting. There are several layers of security features in the redesigned $100 note, including two new public security features: the 3-D Security Ribbon and the Bell in the Inkwell. The 3-D Security Ribbon is a blue ribbon on the front of the $100 note with images of bells and 100s. When the note is tilted up and down, the bells and 100s move side-to-side. If the note is tilted from side to side, the bells and 100s move up and down. This security feature, which includes more than 700,000 micro-lenses per note, is woven into the paper, not printed on it. The Bell in the Inkwell is a color-shifting bell, inside a copper inkwell, on the front of the note. The inkwell and bell are both copper until the note is moved. When tilted, the bell changes from copper to green, an effect that makes the bell seem to appear and disappear within the inkwell. The latest counterfeiting data indicates that the 3-D Security Ribbon and the Bell in the Inkwell are effective counterfeit deterrent measures for threats posed to the $100 note.

The NXG series, including the new $100 note, contain an array of counterfeit deterrent security features, some of which are visible and easily recognizable to the public (micro-printing, raised printing, symbols of freedom, a watermark, security thread and color shifting ink) and some of which are covert or machine readable only. The redesigned notes also include a digital counterfeit deterrent system that was developed under the auspices of the Central Bank Counterfeit Deterrence Group (CBCDG) to thwart digital counterfeiting. The CBCDG digital counterfeit deterrent system, which is being used in a number of countries, relies on a hidden 'marker' embedded in the note's design that can be read or detected by software deployed in digital printers.

NXG $100 Note

The NXG $100 note currency paper is unlike that used for all other denominations. It is a composite of paper and plastic. The optically variable thread (the 3-D security ribbon) is a ¼ inch wide plastic strip that is woven into each sheet. The new 3-D security ribbon feature is unique to U.S. currency. The ribbon is wider, more complex, and more visible than similar ribbons used by other countries. Working with this paper on legacy printing and processing equipment at both the BEP and its paper supplier was and continues to be a challenge. BEP continues to study the options for renovation/replacement of the Washington, DC facility.

NXG $100 Note Production

During the summer of 2010, an issue with sporadic creasing of the paper during printing of the NXG $100 note was detected. By September 2010, this issue was severe and NXG $100 note production was suspended. At that time, there was no existing technology available to detect creasing and no obvious cause of, or solution to, the problem. Resolving this complex problem

required collaboration among the BEP, the Board, the USSS, and the paper supplier, Crane & Co.

Root cause investigation at the BEP and Crane revealed important contributors, which included variation in the leading edge of a sheet of paper, the length of time between paper manufacture and printing, the paper's moisture content, and the amount of recycled material in the paper. The paper manufacturer was given more detailed specifications and made several process changes. BEP personnel developed an innovative printing press set-up involving "bowing" of the normally straight press front lay and modification of front lay stops, including changes to the configuration of machinery and modifications to the manufacturing process. These changes dramatically increased robustness of the printing process and resulted in significantly reduced rates of creasing. The BEP also developed and installed four additional high-resolution cameras to inspect the sheets for creasing on its automated, high-speed inspection lines. This system identifies and rejects sheets with creases.

Once the changes were made and tested, a path forward included a robust production validation process that was agreed to by the BEP, the Board, and the USSS. This process involved examining and verifying raw material improvements, press modifications, and the creation of a crease detection system prior to returning to full-scale production with a manageably low level of creasing.

In June 2013, the BEP delivered a very small amount of mashed notes, less than 0.5 percent, intermixed with good notes to the Board. Mashing is caused when excess ink on an engraved plate is transferred to the paper resulting in a blurry image. The BEP has acquired machines to sort these notes and reject those that do not meet quality standards. The BEP is building a more robust quality assurance system to address the technical/production/quality issues that became evident with the development and manufacture of the redesigned $100 note and to better prepare for more complex future designs. Through our Currency Quality Assurance (CQA) program, we are developing a more robust design process that provides for improved material specifications and design for manufacturability. The BEP is committed to producing the highest quality currency. As such, the BEP has reassessed currency operations and support functions to ensure that the quality system and its components are functioning effectively. The BEP feels confident that the CQA program coupled with recent leadership changes will result in it producing a more consistent, high quality note.

Meaningful Access

On May 3, 2002, a complaint was filed in the U.S. District Court for the District of Columbia against the Department of the Treasury, alleging that the currency of the United States violated Section 504 of the Rehabilitation Act because the blind and visually impaired could not

denominate it. A decision, rendered on October 3, 2008, directed that steps be taken, as may be required, to provide meaningful access to U.S. currency for blind and visually impaired persons as part of the next currency redesign.

The BEP has been actively engaged in identifying meaningful access solutions that fully comply with the Court's order, while also giving appropriate consideration to the interests of domestic and international users of currency, U.S. businesses, and cash handling and cash-intensive industries.

In January 2008, the BEP commissioned a study to assess options to enable the blind and visually impaired to better denominate U.S. currency. The study consisted of three phases:

- Phase 1: Gather data about the demographics of the visually impaired community and the usefulness of various accommodations.
- Phase 2: Review features currently available to improve access to the visually impaired via discussions with the international banknote community and experts in vision loss and tactility.
- Phase 3: Conduct a cost-benefit analysis on the alternatives identified in the first two phases. This included considering the benefits to the visually impaired and the costs to the government, industry and the general public.

Additionally, the study provided a decision model, by which the BEP could evaluate various potential accommodations. Based on the study results, the BEP drafted proposed recommendations to the Secretary of the Treasury, who by statute has the sole authority for approving U.S. currency designs. The ACD Committee, which includes leadership from the Department of the Treasury, the Board, and the USSS approved the proposed recommendations. The recommendations included pursuing development of a raised tactile feature on each note that the BEP may lawfully alter; continued use of large, high contrast numerals and background colors on each note that the BEP may lawfully alter; and a currency reader program. On May 31, 2011, the Secretary of the Treasury approved the three-pronged strategy to provide meaningful access to U.S. Federal Reserve notes for the blind and visually impaired community.

Meaningful Access (Currency Reader Program)

One key part of that is to establish a nation-wide currency reader distribution program. The currency reader distribution program is designed as the one method that provides virtually all blind and visually impaired U.S. citizens and legal residents with a means to independently denominate Federal Reserve notes. The currency reader distribution program is expected to provide a useful option for the entire blind and visually impaired community for many years

because under current plans: 1) tactile-enhanced Federal Reserve notes are expected to be issued in accord with the historical practice of issuance of one denomination at a time, 2) per Congressional direction the $1 denomination cannot be redesigned, and 3) current-design banknotes without tactile features are expected to co-circulate with tactile-enhanced banknotes for many years.

In February 2013, the BEP sought a legal opinion from the Government Accountability Office (GAO), as to whether BEP has authority to give – rather than loan – currency readers to eligible individuals under the provisions of Section 504 of the Rehabilitation Act. The BEP believed this had implications on all facets of the program, but most directly on determining the most cost-effective distribution methods. In June 2013, GAO determined that the BEP may purchase and give currency readers to blind and visually impaired individuals as part of its compliance with the Court order to provide individuals with meaningful access to U.S. currency.

To leverage existing expertise, the BEP contracted for currency reader program support from the Library of Congress National Library Services for the Blind and Physically Handicapped (LOC/NLS). The BEP based the original framework of its currency reader eligibility requirements on the LOC/NLS's Talking Books Program, where digital book readers and library materials are loaned to individuals with disabilities. Details regarding the level of support from the LOC/NLS included designing and implementing a program infrastructure that provides a database management system to process requests for currency readers and to distribute them to approved applicants.

The BEP anticipates distributing between 100,000 and 500,000 currency readers to people who are blind or visually impaired. We plan to launch a pilot program this summer and roll the program out nationally in 2015. The project plan is under joint development and will be operated by the BEP and the LOC/NLS.

Meaningful Access (Mobile Applications)

Additionally, since the 2008 Court 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 a banknote denominating application (app) for mobile devices. In 2010, the BEP developed the EyeNote® app, designed to allow individuals to denominate Federal Reserve notes using a mobile device operating on the Apple iOS platform. The app is available as a free download from the Apple App Store℠, and we anticipate that it will play an increasing role in providing meaningful access to currency. 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. To date, these apps have had more than 17,000 downloads.

Meaningful Access (Tactile Feature Technology)

Moreover, the BEP has performed rigorous analyses on several aspects of applied tactile features. The BEP is evaluating materials and application methods for ease of application, cost, and tactility, in addition to durability in circulation. To date, the BEP has produced a set of tactile samples using four application techniques: screen printing, coating, intaglio printing, and over-coated/embossing. A BEP meaningful access tactile feature team identified the evaluation criteria to be used to rate the overall effectiveness of the samples produced using each of the four application techniques under development: durability, usability, cost, and risk. The four types of tactile feature samples were subjected to a strenuous regime of laboratory tests to evaluate their durability in terms of adhesion to the substrate, cohesion of the material itself and wear resistance. Internal teams were formed to collect and analyze data and information relevant to each of the four evaluation criteria. Based on the results of this testing, one method was eliminated from consideration. Additional testing on the three remaining application methods is required prior to making the final selection. A project team has been created to develop the necessary data and present a recommendation as to which of the three application techniques best meet the established criteria. We anticipate having the application method, which determines the equipment type required, 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.

Any tactile feature must, as a practical matter, be incorporated in the 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 the BEP is developing tactile features, it is working closely with the Board, the USSS, and the Departmental Offices of the Treasury to identify threats and determine appropriate measures to respond to them. As part of the redesign, the BEP is aggressively seeking and developing overt and covert security features, which will require a lengthy technical development process. 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, requiring appropriate progress on several fronts.

The ACD Committee has recommended that the $10 note be the next note to be redesigned. The BEP, therefore, anticipates that the redesigned $10 note will be the first denomination to contain

a tactile feature, an improved large, high-contrast numeral, and new security features. As a result, it is not expected that the redesigned note will be released before 2020. However, the projection of initial circulation of redesigned currency, which by court order must "take such steps as may be required to provide meaningful access to United States currency for blind and other visually impaired persons" 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, design development, and repetitive testing to ensure a smooth transition into production. As a result, no firm date for the introduction has been established. This is one of the reasons that BEP is moving forward with the currency reader program this year.

Future Currency Redesigns

When deliberating the various options for the next denomination to be redesigned, the ACD Committee engaged 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 placed 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 our most senior personnel have been tasked with this complex endeavor.

Conclusion

Mr. Chairman, this concludes my remarks about initiatives at the BEP. I will be happy to respond to any questions you or other members of the Subcommittee may wish to ask. Thank you.

Andrew Mills

Director of Circulating Coin

Written testimony to the

United States House of Representatives

Committee on Financial Services

The Subcommittee on Monetary Policy and Trade

Hearing on

"The Production and Circulation of Coins and Currency"

The Royal Mint's work to control the cost of producing circulating coins.

June 11, 2014

Introduction

The Royal Mint is a government owned company with a single shareholder Her Majesty's Treasury, in addition to being our owner HM Treasury is also our UK customer and our primary function is to produce UK coinage and act as their agent in supplying this coinage to banks and the Post Office on their behalf.

The Royal Mint is the oldest manufacturing business in the UK we can trace our history back over a 1,000 years to when we were located in the Tower of London, we then moved to Tower Hill until 1968 when we relocated to a purpose built 38 acre site in Llantrisant, South Wales in preparation for the decimalistion of UK coinage. Please see **Appendix i** for further background material.

In the past 5 years business as usual demand for the 8 UK denominations has totalled just over 1 billion pieces in total and we have a total capacity to make 4 billion pieces a year. The remaining capacity is used to supply struck coins and coinage blanks to overseas central bank and Mints around the world, we also supply tooling, metal recovery services for demoneterised coins and consultancy to these customers, which is why we describe ourselves as the 'World's Leading Export Mint'.

We have day to day contact with officials at HM Treasury acting as their technical advisor; these officials recommend policy to Minister's who make the decision on which policies to adopt that affect UK coinage. Proposed changes are also subject to consultation with industry stakeholders and the general public before implementation.

Technology and investment

The Royal Mint has developed a number of capabilities that enable us to control the cost of producing circulating coins for our customers.

Our aRMour™ plating technology replaces expensive solid alloy coins with a mild steel core electroplated with either nickel, brass or copper. This single layer or mono plate of typically 25 microns allows for a lifetime in circulation in excess of 20 years unlike multilayer plating where the thin outer layer of only 6 to 9 microns can wear through in as little as 5 years in circulation exposing the underlying copper layer. In some countries this has led the general public to believe relatively new coins were going rusty. The Royal Mint invested approximately £20m in two aRMour™ nickel plating lines and a water treatment plant three years ago and is now investing a further £16m in a new multi chemistry plating line that will be operational by Christmas 2015. Please see **Appendix ii** for more detail on aRMour™ electro plating.

Our new award winning iSIS technology for the first time brings a machine readable high security feature that up until now was only available in banknotes to cost effective aRMour™ plated coins. iSIS coins can be read at over 4,000 coins a minute and provides a definitive binary authentication; its either a genuine coin or it's a

counterfeit unlike today's electromagnetic sensing that has a wide acceptance window and varies overtime. The high security additive is co-deposited in the aRMour™ plating layer and is therefore constantly exposed to be read as the coin wears in circulation.

We were delighted when the Chancellor of the Exchequer announced the new One Pound coin in this year's Budget and confirmed that it will contain the iSIS feature.

The importance of the iSIS development is shown by the availability on Ali Baba, an e-commerce company, not only of what until recently were thought to be coinage alloys only available to authorised Mints but also what appears to be struck coin. The new investment mentioned above will include making the new multi-chemistry line iSIS capable and converting an existing line to be fully iSIS capable. Please see **Appendix iii** for more information about iSIS.

United Kingdom Circulating Coin Cost Control

The Royal Mint works to control the cost of circulating coin in two main areas one being UK coinage and the other with our overseas customers. First I will summarise the cost reductions that we have implemented on behalf of HM Treasury since decimalisation.

On February 15 1971 decimal coinage was introduced in the UK, I would like to summarise the changes to this coinage system since its introduction to control its costs and ensure that it remains fit for purpose. To give a perspective of the cost savings or cost avoidance I have calculated the metal saving of each of these changes since they were made based on subsequent issuance of that coin each year from that in which the change was made up to 2013 using London Metal Exchange metal prices on 31 March 2014.

In 1984 the then Chancellor of the Exchequer, Nigel Lawson announced that the decimal halfpenny would be not be manufactures from February of that year and it ceased to be legal tender in December 1984. The halfpenny was a bronze alloy coin weighing 1.78g and in the last complete year of production 190.7m were issued at a metal cost as stated above of £1.4m.

The Royal Mint launched the consultation in July 1987 concerning changes to the coinage structure that led to the reduction in size of the 5p and 10p coins. A booklet was produced which described possible changes to the coinage. It also included some of the results of research by the Department of Psychology of the University of Nottingham into the ability of individuals to distinguish between two different coins by sight and touch.

The publication set out the requirements for a good coinage system, the constraints on change and the need for change.

Four possible options were published and the focus was on reducing the size and shape of the 50p, reducing the size of the 10p, changing the size, shape and alloy of the 5p and the possible removal of the 2p.

In advance of the public consultation The Royal Mint commissioned a survey of public opinion on the four options. This was undertaken by a market research company who questioned 2400 adults in the UK. The results of this survey were published in the consultation document.

The consultation sought to establish whether the proposed changes would lead to savings or increased costs and what advantages or disadvantages would there be for bulk users of coins such as banks, the vending industry, transport and milkmen!

Comments were invited from all these groups and individuals as part of the consultation process.

As a result the smaller coins were introduced in 1992, the change to the 5p has saved £63m in metal costs based on issuance since and the change to the 10p has saved £72.3m.

In 1992 the 1p and 2p coins were converted from a bronze alloy to aRMour copper plated steel to reduce cost, the weight was kept constant for both coins as was the diameter. This meant that most of the public were unaware of the change being made unless they noticed that the new coins were now attracted by a magnet.

The plated 1p has saved £147.4m in reduced metal costs since 1992 and the plated 2p has saved £133.7m over the same time.

A review of UK coinage took place in 1994 with particular focus on replacing the 50p coin with a smaller coin and the possible introduction of a £2 coin.

The Royal Mint launched the consultation in October which outlined the options for consideration. The consultation was expected to take around two months and the public were asked to respond to direct questions as well as inviting additional comments.

Responses to all consultations were returned to the Royal Mint for analysis prior to formal recommendations submitted to HM Treasury. As a result the smaller 50p was introduced in September 1997 ready for coin demand leading up to Christmas that year. The larger 50p was removed from circulation in 6 months to assist the vending industry as co-circulation of different specification coins of the same denomination can lead to lower reliability of their machines.

The metal saving from the reduction in size of the 50p has been £29.2m in lower metal costs since introduction.

In September 2009 HM Treasury announced that the cupro-nickel 5p and 10p coins would be replaced with aRMour™ nickel plated versions to reduce production cost

and increase seigniorage. The initial date for introduction was January 2011, following consultation with stakeholders this was delayed until January 2012 to allow for vending machine operators to update coin mechanisms to accept the new coins.

The aRMour™ nickel plated 5p has saved £10.9m and the aRMour™ nickel plated 10p has saved £9.7m since they were introduced on the same basis as the other savings previously mentioned. Please see **Appendix iv** for historical consultation leaflets, the table of the savings mentioned above and UK coin issuance figures by year.

Overall Summary

Approximate Size Savings

	Year of Change	Pieces to 2013 (bn)	Metal Saving £m
50p	1997	1.0	29.2
10p	1992 (to 2012)	2.8	72.3
5p	1992 (to 2012)	4.9	63.0
Total			164.5

Approximate Solid to Plated Savings

	Year of Change	Pieces to 2013 (bn)	Metal Saving £m
1p	1992	13.2	147.4
2p	1992	6.0	133.7
5p	2012	0.8	10.9
10p	2012	0.4	9.7
Total			301.7

The metal rates are based upon those prevailing from the LME at 31.03.14.

The volumes are calendar year issues.

In the 2012 Autumn Statement the Chancellor of the Exchequer announced the active withdrawal of the cupronickel 5p and 10p coins from circulation and their return to the Royal Mint. The sorting is carried out at private sector cash centres by a partner chosen following a tendering process. In the first year of operation the Pro Active Replacement programme delivered £15m of benefit to HM Treasury. This programme also benefits the UK vending industry in reducing time that the different specification 5p and 10p coins will co-circulate. The programme also benefits the Cash InTransit industry as there is a need for increased transport.

For these changes to take place it cannot be emphasised enough how important stakeholder engagement is from early on in the process. The Royal Mint has regular dialogue with trade associations that represent different facets of the coin acceptance industry including vending, parking and amusements and retailers. We also have close working relationships with the major coin mechanism and sorting companies that provide equipment in the UK. This is addition to institutions such as the Royal National Institute for the Blind

Not only does the UK coinage model frequently review the costs of production and market acceptance of coins it also ensures that new coins are not struck when surplus coins are held by the industry members as once coins are in circulation they cannot be returned to HM Treasury or the Royal Mint. The Royal Mint, banks and the Post Office meet weekly to trade surplus coins with deficit members. Coins are traded at face value plus a delivery charge from the surplus member.

Overall costs are also optimised by using a forecasting process agreed between UK Payments (an industry body that represents retail banks and cash handling companies), the Royal Mint and HM Treasury.

The Royal Mint establishes the estimated annual demand for the year by the end of each January. This will be based on demand from previous years, excluding any years where demand has been distorted by unusual factors.

The industry uses individual member forecasts to establish an overall forecast for the annual demand within the same time scale for comparison purposes.

On the basis of the above, there is an agreed annual estimate.

In addition, prior to each quarter, the Royal Mint will prepare forecast schedules of estimated despatches broken down by month, to be discussed with the industry and finalised by the Royal Mint and the industry no later than one month in advance of each quarter.

Total volumes estimated to be available for drawing each month are packed and available from the first week of each period, with confirmation of availability of the volume agreed for each period provided to the industry by the Royal Mint by the end of the first week of each period.

Since 2013 there has been a Coin Circulation Scheme (CCS) in the UK that is an agreement between all stakeholders involved in forecasting, distribution, processing and management of coin in the UK. The CCS sets out what is in the collaborative space for the UK coin industry and the roles and responsibilities of each member.

The CCS covers many of the items previously mentioned issue of new coin, changes to size and specification, introduction or withdrawal of a denomination, changes to specifications, packaging standards, forecasting and detection of counterfeit coins.

Recent Activity in the United States

The Royal Mint provided input into the Concurrent Technologies Corporation Alternative Metals Study and met with various stakeholders. Please see **Appendix v** for a summary of the report regarding the Royal Mint's contribution and a paper summarising other meetings in the United States.

Overseas Currency Costs Control

Examples of the Royal Mint controlling the cost of circulating coins for overseas customers are both in the active conversion of solid alloy coins to aRMour™ plated coins and the cost control of the total currency budget by converting low denomination banknotes to coins.

A recent example of the former is the three year contract award to the Royal Mint by the central bank of Poland to supply three aRMour™ brass plated struck coin denominations to replace solid alloy versions. An example of the latter is the conversion of the Tanzanian 500 shilling banknote to aRMour™ nickel plated steel struck coin including a latent image to provide overt security and public engagement.

Appendix

Appendices relate to respective material submitted for the record with this testimony to the United States House of Representatives Committee on Financial Services Subcommittee on Monetary Policy and Trade on June 11, 2014.

Appendix i

TRM, Making money for everyone - (TRM Opening Presentation_V2 November 2012.pdf)

TRM, The Worlds Currency - (TRM Overview Flyer 2013.pdf)

TRM, Manufacturing – (Manufacturing Presentation_V1 January 2013.pdf)

Appendix ii

TRM, aRMour® – (TRM aRMour Presentation – V1 October 2012.pdf)

TRM, aRMour® Plated Steel Coins and Coin Blanks – (TRM Armour Brochure 2013.pdf)

Appendix iii

iSIS™ Integrated Secure Identification Systems, The new generation of coin – (iSIS from the Royal Mint 2013.pdf)

TRM Coin Press – (TRM Coin Press – Customer Edition Spring 2014.pdf)

iSIS™ Brochure – (TRM iSIS in UK 1 pound brochure.pdf)

iSIS™ Integrated Secure Identification Systems – (TRM iSIS Sales Presentation – V1 May 2013.pdf)

Ali Baba screen shot One Pound Coin

Appendix iv

TRM, Mintage Figures – (RMM-Mintage-Figures1.pdf)

Appendix v

Extracts from the Alternative Metals Study – (US Coinage Reform - TRM Summary of CTC Report.pdf)

Historical consultation document – (Summary of Public Consultations.pdf)

Briefing Paper For United States Congressional Committees And Stakeholder Groups – (The Royal Mint Briefing Paper.pdf)

Andrew Mills

Director of Circulating Coin

Written testimony to the

United States House of Representatives

Committee on Financial Services

The Subcommittee on Monetary Policy and Trade

Hearing on

"The Production and Circulation of Coins and Currency"

The Royal Mint's work to control the cost of producing circulating coins.

June 11, 2014

Introduction

The Royal Mint is a government owned company with a single shareholder Her Majesty's Treasury, in addition to being our owner HM Treasury is also our UK customer and our primary function is to produce UK coinage and act as their agent in supplying this coinage to banks and the Post Office on their behalf.

The Royal Mint is the oldest manufacturing business in the UK we can trace our history back over a 1,000 years to when we were located in the Tower of London, we then moved to Tower Hill until 1968 when we relocated to a purpose built 38 acre site in Llantrisant, South Wales in preparation for the decimalistion of UK coinage. Please see **Appendix i** for further background material.

In the past 5 years business as usual demand for the 8 UK denominations has totalled just over 1 billion pieces in total and we have a total capacity to make 4 billion pieces a year. The remaining capacity is used to supply struck coins and coinage blanks to overseas central bank and Mints around the world, we also supply tooling, metal recovery services for demoneterised coins and consultancy to these customers, which is why we describe ourselves as the 'World's Leading Export Mint'.

We have day to day contact with officials at HM Treasury acting as their technical advisor; these officials recommend policy to Minister's who make the decision on which policies to adopt that affect UK coinage. Proposed changes are also subject to consultation with industry stakeholders and the general public before implementation.

Technology and investment

The Royal Mint has developed a number of capabilities that enable us to control the cost of producing circulating coins for our customers.

Our aRMour™ plating technology replaces expensive solid alloy coins with a mild steel core electroplated with either nickel, brass or copper. This single layer or mono plate of typically 25 microns allows for a lifetime in circulation in excess of 20 years unlike multilayer plating where the thin outer layer of only 6 to 9 microns can wear through in as little as 5 years in circulation exposing the underlying copper layer. In some countries this has led the general public to believe relatively new coins were going rusty. The Royal Mint invested approximately £20m in two aRMour™ nickel plating lines and a water treatment plant three years ago and is now investing a further £16m in a new multi chemistry plating line that will be operational by Christmas 2015. Please see **Appendix ii** for more detail on aRMour™ electro plating.

Our new award winning iSIS technology for the first time brings a machine readable high security feature that up until now was only available in banknotes to cost effective aRMour™ plated coins. iSIS coins can be read at over 4,000 coins a minute and provides a definitive binary authentication; its either a genuine coin or it's a

counterfeit unlike today's electromagnetic sensing that has a wide acceptance window and varies overtime. The high security additive is co-deposited in the aRMour™ plating layer and is therefore constantly exposed to be read as the coin wears in circulation.

We were delighted when the Chancellor of the Exchequer announced the new One Pound coin in this year's Budget and confirmed that it will contain the iSIS feature.

The importance of the iSIS development is shown by the availability on Ali Baba, an e-commerce company, not only of what until recently were thought to be coinage alloys only available to authorised Mints but also what appears to be struck coin. The new investment mentioned above will include making the new multi-chemistry line iSIS capable and converting an existing line to be fully iSIS capable. Please see **Appendix iii** for more information about iSIS.

United Kingdom Circulating Coin Cost Control

The Royal Mint works to control the cost of circulating coin in two main areas one being UK coinage and the other with our overseas customers. First I will summarise the cost reductions that we have implemented on behalf of HM Treasury since decimalisation.

On February 15 1971 decimal coinage was introduced in the UK, I would like to summarise the changes to this coinage system since its introduction to control its costs and ensure that it remains fit for purpose. To give a perspective of the cost savings or cost avoidance I have calculated the metal saving of each of these changes since they were made based on subsequent issuance of that coin each year from that in which the change was made up to 2013 using London Metal Exchange metal prices on 31 March 2014.

In 1984 the then Chancellor of the Exchequer, Nigel Lawson announced that the decimal halfpenny would be not be manufactures from February of that year and it ceased to be legal tender in December 1984. The halfpenny was a bronze alloy coin weighing 1.78g and in the last complete year of production 190.7m were issued at a metal cost as stated above of £1.4m.

The Royal Mint launched the consultation in July 1987 concerning changes to the coinage structure that led to the reduction in size of the 5p and 10p coins. A booklet was produced which described possible changes to the coinage. It also included some of the results of research by the Department of Psychology of the University of Nottingham into the ability of individuals to distinguish between two different coins by sight and touch.

The publication set out the requirements for a good coinage system, the constraints on change and the need for change.

Four possible options were published and the focus was on reducing the size and shape of the 50p, reducing the size of the 10p, changing the size, shape and alloy of the 5p and the possible removal of the 2p.

In advance of the public consultation The Royal Mint commissioned a survey of public opinion on the four options. This was undertaken by a market research company who questioned 2400 adults in the UK. The results of this survey were published in the consultation document.

The consultation sought to establish whether the proposed changes would lead to savings or increased costs and what advantages or disadvantages would there be for bulk users of coins such as banks, the vending industry, transport and milkmen!

Comments were invited from all these groups and individuals as part of the consultation process.

As a result the smaller coins were introduced in 1992, the change to the 5p has saved £63m in metal costs based on issuance since and the change to the 10p has saved £72.3m.

In 1992 the 1p and 2p coins were converted from a bronze alloy to aRMour copper plated steel to reduce cost, the weight was kept constant for both coins as was the diameter. This meant that most of the public were unaware of the change being made unless they noticed that the new coins were now attracted by a magnet.

The plated 1p has saved £147.4m in reduced metal costs since 1992 and the plated 2p has saved £133.7m over the same time.

A review of UK coinage took place in 1994 with particular focus on replacing the 50p coin with a smaller coin and the possible introduction of a £2 coin.

The Royal Mint launched the consultation in October which outlined the options for consideration. The consultation was expected to take around two months and the public were asked to respond to direct questions as well as inviting additional comments.

Responses to all consultations were returned to the Royal Mint for analysis prior to formal recommendations submitted to HM Treasury. As a result the smaller 50p was introduced in September 1997 ready for coin demand leading up to Christmas that year. The larger 50p was removed from circulation in 6 months to assist the vending industry as co-circulation of different specification coins of the same denomination can lead to lower reliability of their machines.

The metal saving from the reduction in size of the 50p has been £29.2m in lower metal costs since introduction.

In September 2009 HM Treasury announced that the cupro-nickel 5p and 10p coins would be replaced with aRMour™ nickel plated versions to reduce production cost

and increase seigniorage. The initial date for introduction was January 2011, following consultation with stakeholders this was delayed until January 2012 to allow for vending machine operators to update coin mechanisms to accept the new coins.

The aRMour™ nickel plated 5p has saved £10.9m and the aRMour™ nickel plated 10p has saved £9.7m since they were introduced on the same basis as the other savings previously mentioned. Please see **Appendix iv** for historical consultation leaflets, the table of the savings mentioned above and UK coin issuance figures by year.

Overall Summary

Approximate Size Savings

	Year of Change	Pieces to 2013 (bn)	Metal Saving £m
50p	1997	1.0	29.2
10p	1992 (to 2012)	2.8	72.3
5p	1992 (to 2012)	4.9	63.0
Total			164.5

Approximate Solid to Plated Savings

	Year of Change	Pieces to 2013 (bn)	Metal Saving £m
1p	1992	13.2	147.4
2p	1992	6.0	133.7
5p	2012	0.8	10.9
10p	2012	0.4	9.7
Total			301.7

The metal rates are based upon those prevailing from the LME at 31.03.14.

The volumes are calendar year issues.

In the 2012 Autumn Statement the Chancellor of the Exchequer announced the active withdrawal of the cupronickel 5p and 10p coins from circulation and their return to the Royal Mint. The sorting is carried out at private sector cash centres by a partner chosen following a tendering process. In the first year of operation the Pro Active Replacement programme delivered £15m of benefit to HM Treasury. This programme also benefits the UK vending industry in reducing time that the different specification 5p and 10p coins will co-circulate. The programme also benefits the Cash InTransit industry as there is a need for increased transport.

For these changes to take place it cannot be emphasised enough how important stakeholder engagement is from early on in the process. The Royal Mint has regular dialogue with trade associations that represent different facets of the coin acceptance industry including vending, parking and amusements and retailers. We also have close working relationships with the major coin mechanism and sorting companies that provide equipment in the UK. This is addition to institutions such as the Royal National Institute for the Blind

Not only does the UK coinage model frequently review the costs of production and market acceptance of coins it also ensures that new coins are not struck when surplus coins are held by the industry members as once coins are in circulation they cannot be returned to HM Treasury or the Royal Mint. The Royal Mint, banks and the Post Office meet weekly to trade surplus coins with deficit members. Coins are traded at face value plus a delivery charge from the surplus member.

Overall costs are also optimised by using a forecasting process agreed between UK Payments (an industry body that represents retail banks and cash handling companies), the Royal Mint and HM Treasury.

The Royal Mint establishes the estimated annual demand for the year by the end of each January. This will be based on demand from previous years, excluding any years where demand has been distorted by unusual factors.

The industry uses individual member forecasts to establish an overall forecast for the annual demand within the same time scale for comparison purposes.

On the basis of the above, there is an agreed annual estimate.

In addition, prior to each quarter, the Royal Mint will prepare forecast schedules of estimated despatches broken down by month, to be discussed with the industry and finalised by the Royal Mint and the industry no later than one month in advance of each quarter.

Total volumes estimated to be available for drawing each month are packed and available from the first week of each period, with confirmation of availability of the volume agreed for each period provided to the industry by the Royal Mint by the end of the first week of each period.

Since 2013 there has been a Coin Circulation Scheme (CCS) in the UK that is an agreement between all stakeholders involved in forecasting, distribution, processing and management of coin in the UK. The CCS sets out what is in the collaborative space for the UK coin industry and the roles and responsibilities of each member.

The CCS covers many of the items previously mentioned issue of new coin, changes to size and specification, introduction or withdrawal of a denomination, changes to specifications, packaging standards, forecasting and detection of counterfeit coins.

Recent Activity in the United States

The Royal Mint provided input into the Concurrent Technologies Corporation Alternative Metals Study and met with various stakeholders. Please see **Appendix v** for a summary of the report regarding the Royal Mint's contribution and a paper summarising other meetings in the United States.

Overseas Currency Costs Control

Examples of the Royal Mint controlling the cost of circulating coins for overseas customers are both in the active conversion of solid alloy coins to aRMour™ plated coins and the cost control of the total currency budget by converting low denomination banknotes to coins.

A recent example of the former is the three year contract award to the Royal Mint by the central bank of Poland to supply three aRMour™ brass plated struck coin denominations to replace solid alloy versions. An example of the latter is the conversion of the Tanzanian 500 shilling banknote to aRMour™ nickel plated steel struck coin including a latent image to provide overt security and public engagement.

Appendix

Appendices relate to respective material submitted for the record with this testimony to the United States House of Representatives Committee on Financial Services Subcommittee on Monetary Policy and Trade on June 11, 2014.

Appendix i

TRM, Making money for everyone - (TRM Opening Presentation_V2 November 2012.pdf)

TRM, The Worlds Currency - (TRM Overview Flyer 2013.pdf)

TRM, Manufacturing – (Manufacturing Presentation_V1 January 2013.pdf)

Appendix ii

TRM, aRMour® – (TRM aRMour Presentation – V1 October 2012.pdf)

TRM, aRMour® Plated Steel Coins and Coin Blanks – (TRM Armour Brochure 2013.pdf)

Appendix iii

iSIS™ Integrated Secure Identification Systems, The new generation of coin – (iSIS from the Royal Mint 2013.pdf)

TRM Coin Press – (TRM Coin Press – Customer Edition Spring 2014.pdf)

iSIS™ Brochure – (TRM iSIS in UK 1 pound brochure.pdf)

iSIS™ Integrated Secure Identification Systems – (TRM iSIS Sales Presentation – V1 May 2013.pdf)

Ali Baba screen shot One Pound Coin

Appendix iv

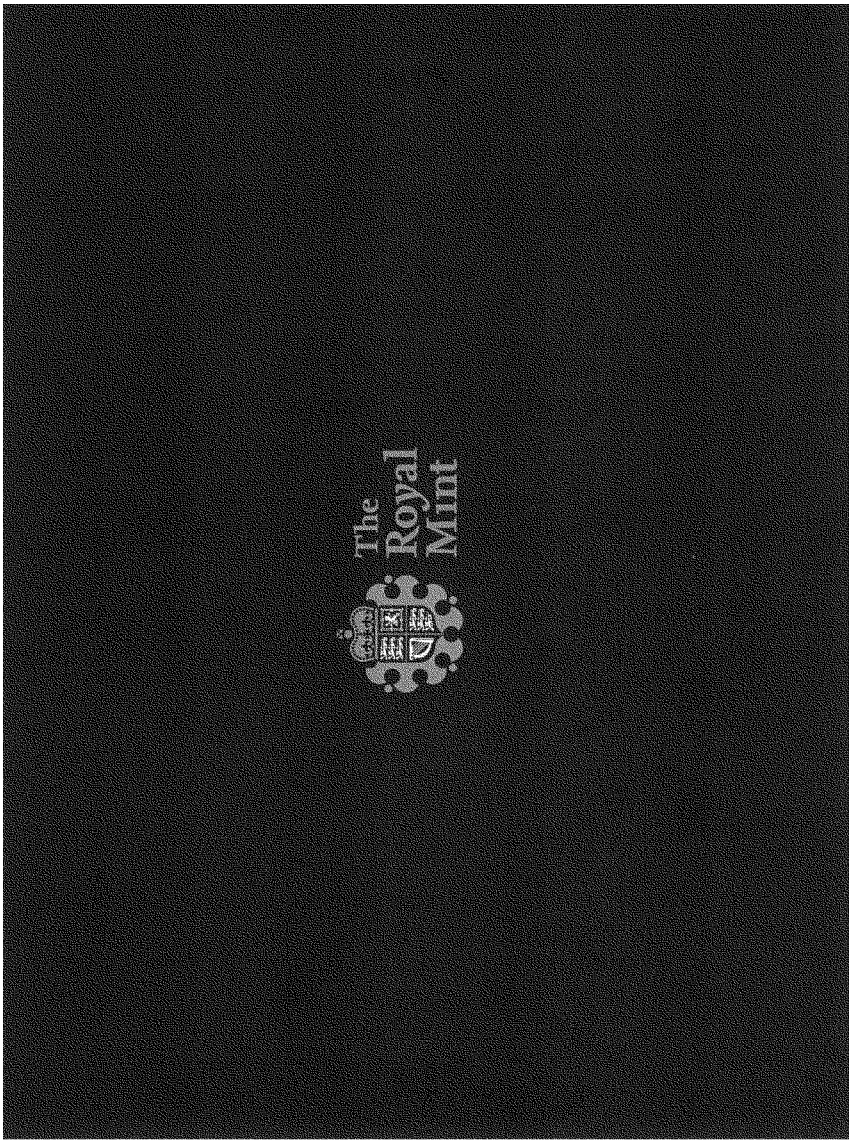
TRM, Mintage Figures – (RMM-Mintage-Figures1.pdf)

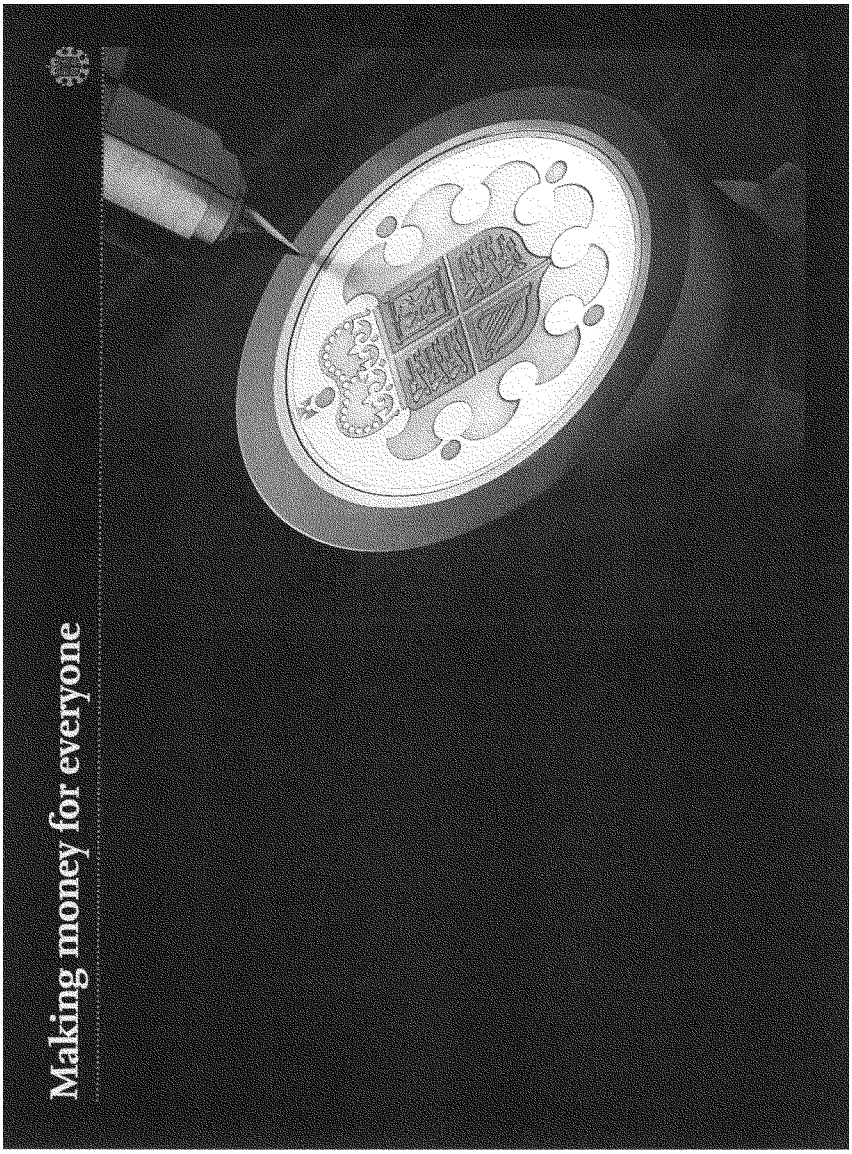
Appendix v

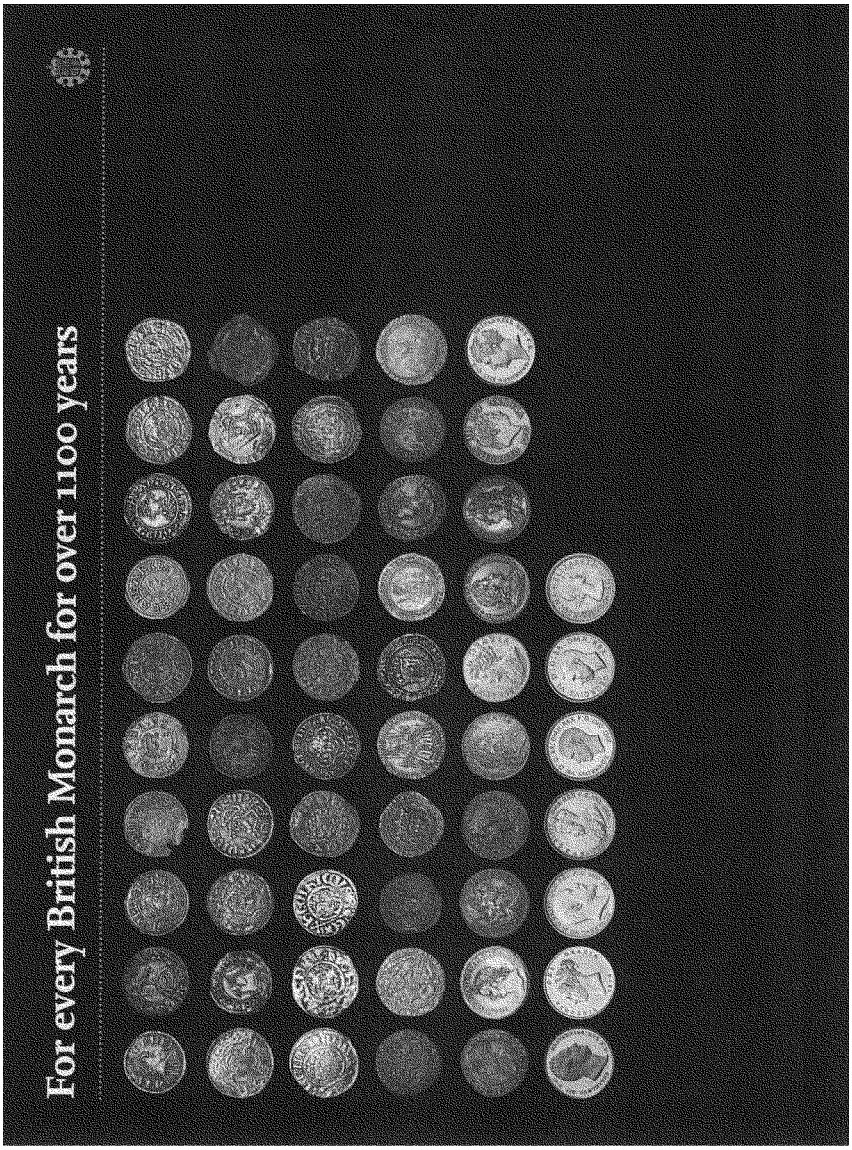
Extracts from the Alternative Metals Study – (US Coinage Reform - TRM Summary of CTC Report.pdf)

Historical consultation document – (Summary of Public Consultations.pdf)

Briefing Paper For United States Congressional Committees And Stakeholder Groups – (The Royal Mint Briefing Paper.pdf)


The
Royal
Mint

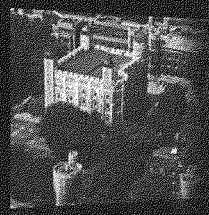

Making money for everyone


For every British Monarch for over 1100 years

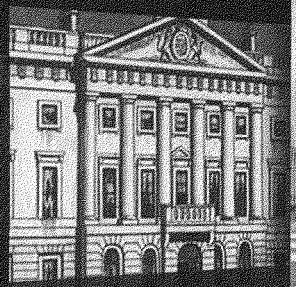
The world's leading export mint

Heritage

Heritage dates back over 1100 years to Anglo-Saxon London



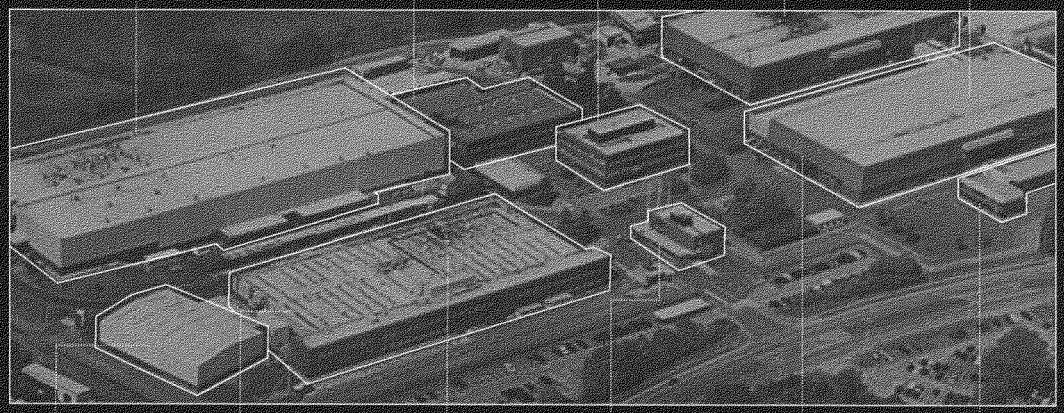
Tower of London
1250 - 1812



Tower Hill, London
1812 - 1968

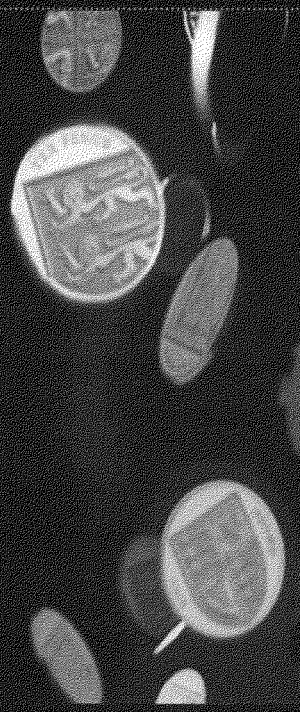
Llantrisant, Wales
1968 to present

One fully integrated site



Wholly owned by the UK Government

- Sole producer of UK circulating coins
- The world's leading export Mint
- Limited company
- PLC style Corporate Governance with Non-Executive Chairman and Directors comprising majority of the Board
- Dividends returned to Shareholder on a consistent basis
- Financial and customer service targets set by Minister

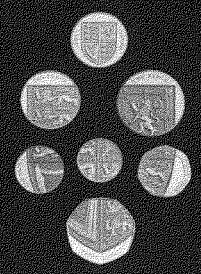


Quality assured for over 700 years

Trial of the Pyx

Full route manufacturing

Our Products



Circulating Coins

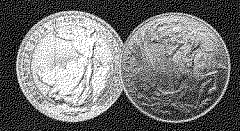
Producer of all legal tender UK Circulating Coins and the world's leading export mint

Commemorative Coins

Design and manufacture precious metal coins and medallions to celebrate national events

Medals

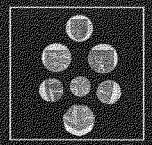
Decorations, Awards and Honours including London 2012 Olympic and Paralympic Medals, military service medals, OBEs and MBEs



Bullion

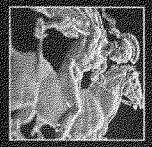
Production and distribution of high quality, trustable investment grade gold coins

Circulating Coins



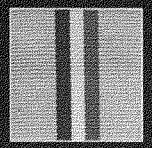
- Producer of all legal tender UK Circulation Coins
- Two thirds of circulation coin and blank production is for the overseas market
- aRMour® plated products provide market leading functionality and lifetime cost of ownership
- Increased focus on coin security both covert and overt

Commemorative Coins



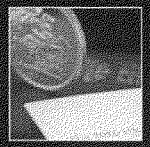
- Strong branding acknowledged for trust and integrity, backed by over 1100 years of history
- Design and manufacture of precious metal commemorative coins and medallions
- An active customer database with considerable recent growth
- Strong on-line presence and e-commerce presence
- Producer of commemorative coins for nationally significant events such as Royal Weddings, Jubilees, London 2012 Olympic and Paralympic Games, and contract minting of important overseas events

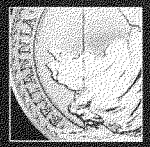
Medals



- Producer of HM Armed Forces Medals for the UK Decorations, Awards and Honours supplied to the Central Chancellery of the Order of Knighthood, which are bestowed by the Queen each year
- Other UK customers include the Home Office, Foreign and Commonwealth Office, Privy Purse Office of the Deputy Prime Minister, HM Prison Service
- Sole producer of the victory medals for the London 2012 Olympic and Paralympic Games
- Supplier of special commemorative medallions for overseas national events and anniversaries

Bullion





- Sovereign is internationally recognised as the world's most precise and reputable traded gold coin, measured to four decimal places by law
- Precious metals are often sought out for long term investment and at times of uncertainty
- Ethical sourcing policy, upholding London Bullion Market Association Standard

Technical Services

- Consultancy Studies
- Product Development and Process Improvement
- Technical Expertise and Support
- Project Management
- Training
- Cash Management
- Reclamation and Recycling

The Executive Management Team

Adam Lawrence
Chief Executive

Shane Bissett
Director of
Commemorative Coin

Phil Carpenter
Director of
Operations

Andrew Mills
Director of
Circulating Coin

Anne Jessopp
Director of
Business Services

Vin Wijeratne
Director of
Finance

Vision Statement

To be recognised as the best Mint in the world

With the UK at our core and leading our markets across the world, we will improve our financial performance every year by being smart in everything we do. We will delight our customers by listening and delivering the best, most trusted products, services and customer experience. Being a great and safe place to work, with a real team spirit, where everybody makes a difference.

By doing this, we will enhance our status as a national treasure and secure a bright future for The Royal Mint, our people, customers and communities.

Our Future

- New products and continued investment in R&D, and geographical expansion
- Sustainable industry-leading financial performance
- Build on 2012 London Olympics and Diamond Jubilee
  - Two of the biggest Commemorative Coin events in our history
- Bullion expansion
- Development of visitors experience
- Continuous improvement culture
- Continuous improvement in all aspects of Safety, Health and Environment
- Capital expenditure in plant and IT

Making money for everyone

The Royal Mint

Commitment to quality

Credibility

We have a recognised track record of supply, quality and on-going technical support.

Our ISO 9001, ISO 14001, ISO 50001 and SA8000 accreditations demonstrate our commitment to quality, the environment, energy management and a safe workplace.

Expertise

We are proven experts in all aspects of currency:

- Specification, design and production of coin currency
- Cash cycle strategy and consultancy
- Cash management, handling, and sorting
- Counterfeit detection
- Mint build and refurbishment consultancy
- Tool design and manufacture

The Royal Mint works with customers to establish alloy recovery programmes for end-of-life coinage, with reclaimed metal sold on to provide a new revenue stream.

Choice and flexibility

Our coins and blanks provide significant cost savings over clad and homogeneous coins as well as increased seigniorage.

Low cost of ownership makes our coins and blanks a viable alternative to banknotes as well as clad and homogeneous coins.

We offer customers the ultimate range of choice including design, materials, construction, and security features.

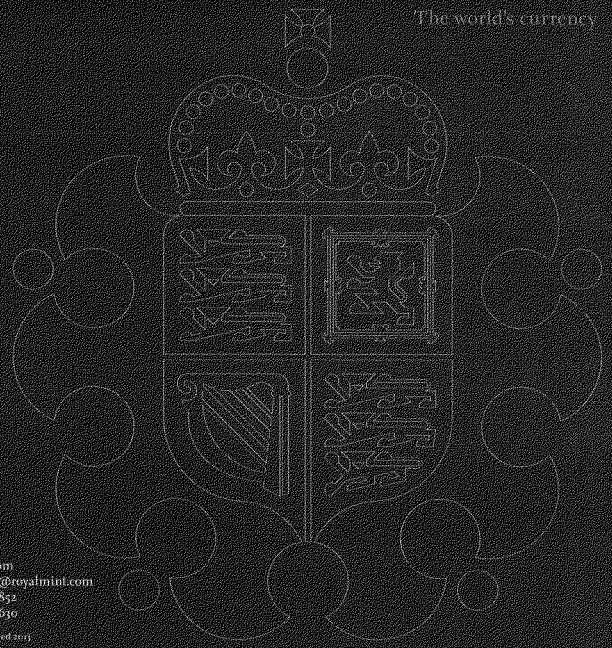
We are able to provide mono-, bi- and tri-colour coins and blanks.

The Royal Mint
Llantrisant
Pontyclun
CF72 8YT
United Kingdom

www.royalmint.com
E : circulatingcoin@royalmint.com
T : +44 (0) 1443 623852
F : +44 (0) 1443 623630

© The Royal Mint Limited 2013

Issue No. May 2013



The Royal Mint

The world's currency

We are the world's leading export mint, with around 50 countries procuring their circulation coin and coin blank requirements from us each year.

At a glance

- Our aRMour full-plate coins and blanks are being used in the currencies of more than 50 countries worldwide, meaning we strike over 180 different denominations a year.
- We produce all legal tender circulation coins and blanks for the UK and its dependencies.
- We issue around 1 billion UK coins per year.
- We strike up to 750,000 pieces an hour, 110 million pieces a week.
- We carry out nearly 500,000 checks just in the plating process every year.
- We continually optimise our processes to produce the highest yield.

aRMour

aRMour is our superior full-plate product, suitable for all coins and coin blanks and available in three different colour options.

Our full-plating process involves a single layer of material (typically 25 microns of nickel, copper or brass) being electroplated directly onto a steel core, resulting in an exceptionally strong bond and superior adhesion compared to other plated products.

An aRMour full-plate coin or blank from The Royal Mint will have a typical lifetime of 25-30 years in circulation.

Fraunhofer, Europe's largest application-oriented research organisation, have verified that full-plate coins have a longer circulation lifespan than dual-plate and multi-plate coins, with two key findings:

- Typically, plated steel core coins wear at 1 micron per year in circulation. Including multi-plate, dual-plate, and full-plate coins.
- Full-plate coins hold a longer circulation lifespan, as the plated layer is thicker.

aRMour copper-plated steel

Being bronze/red in colour, these are a replacement for bronze, copper and other similar coinage materials.

aRMour nickel-plated steel

Silver/white in colour, these have been designed to replace cupro-nickel and similar coinage materials.

aRMour brass-plated steel

Golden/yellow in colour, these have been designed to replace homogeneous brass, nickel-brass, aluminium-bronze and other similar coinage materials.

iSIS

iSIS is a new generation of plated coin that offers uncompromising security at affordable cost.

Three levels of security

Integral to iSIS are its three levels of security: overt (such as latent images and edge lettering), covert (e.g. Electro Magnetic Signature) and for the first time in coins, forensic.

Currency credibility

iSIS actively protects against counterfeiting through authentication via industry-leading high-speed automated detection and validation systems.

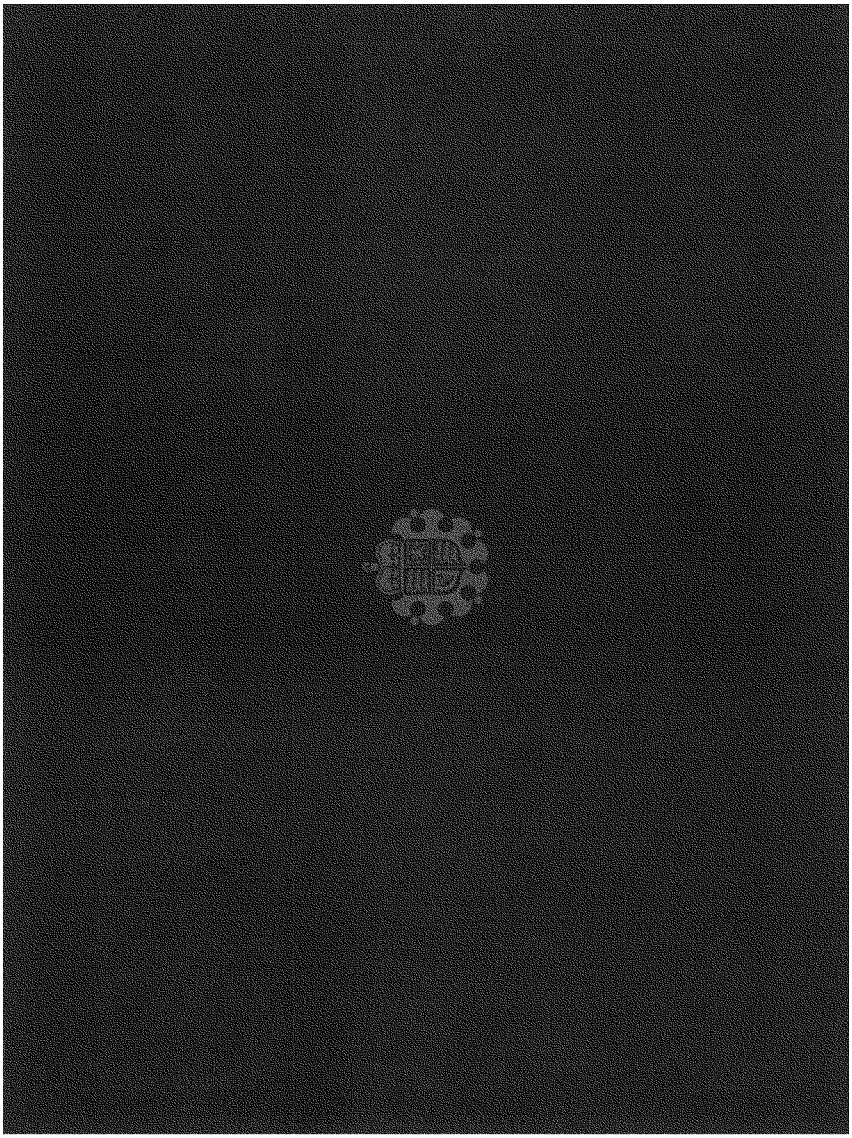
Unequalled durability

With full-plate technology, iSIS will last considerably longer than other plated coins and up to 30 times longer than an equivalent value banknote.

iSIS is underwritten with The Royal Mint's seal of quality and unrivalled expertise in cash system specifications and design.

Lifetime savings

iSIS provides unmatched lifetime savings over traditionally clad and homogeneous coins and equivalent value notes, with its durability dramatically reducing replacement frequency.



Manufacturing

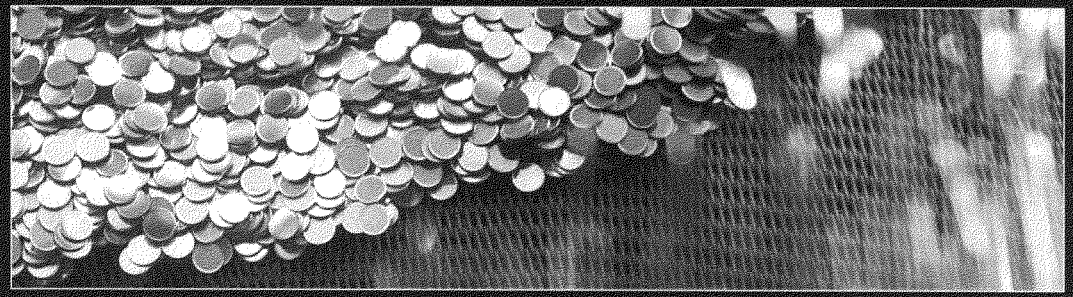
© The Royal Mint Limited 2012. All rights reserved

"We make more money in an hour than David Beckham does in a week."

Leighton John, Head of Production

© The Royal Mint Limited 2012. All rights reserved

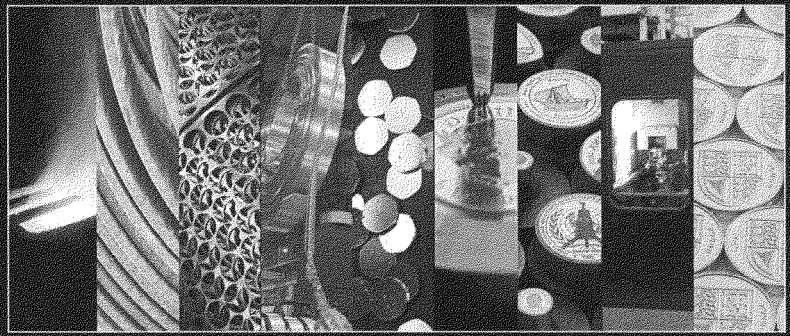
Circulating Coin Blanks



- Visually inspected to remove even the most minute imperfection.
- From strip metal to unfinished blanks within an hour.
- Optimised to produce highest yield with as little waste as possible.
- 9 days from blanking to warehouse.

©The Royal Mint Limited 2012. All rights reserved

Manufacturing



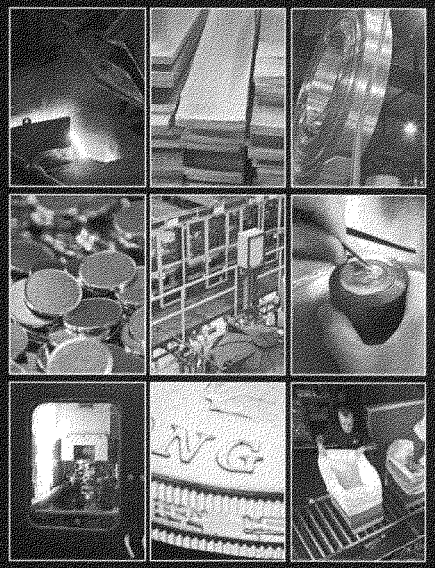
Lean manufacturing techniques and bespoke, state-of-the-art software give transparency and traceability at every step, second by second, person by person.

© The Royal Mint Limited 2012. All rights reserved

The journey of a coin from raw material to warehouse

Some or all of the following stages will take place to produce the desired end product:

- Furnace
- Scalping
- Breakdown rolling
- Finish rolling
- Blanking
- Rimming
- Piercing
- Washing
- Electroplating
- Annealing
- Finishing
- Edge lettering
- Striking
- Telling
- Packing



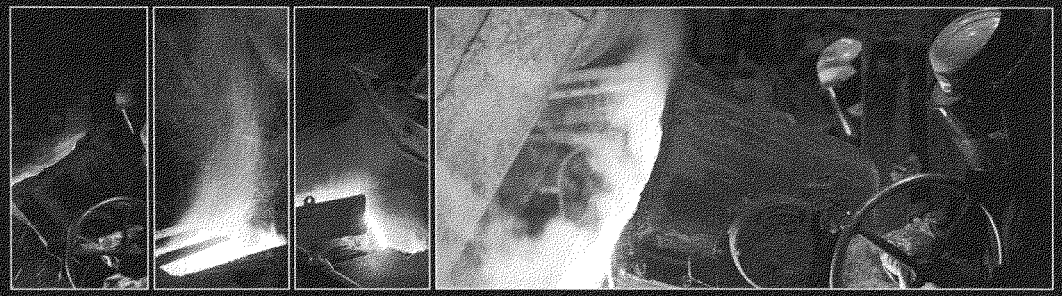
© The Royal Mint Limited 2012. All rights reserved

Health and safety

- No mint has higher health and safety standards.
- The Royal Mint's health and safety standards are equivalent to a nuclear power station's.
- We were the first mint in the world to hold the SA8000 safety standard and also hold the international quality systems standard ISO 9001.
- We currently hold environmental awards from the Welsh Government and ISO 50001, a voluntary international standard for energy management.
- The Royal Mint is a member of the Royal Society for the Prevention of Accidents (RoSPA), and is committed to saving lives and reducing injuries.

© The Royal Mint Limited 2012. All rights reserved

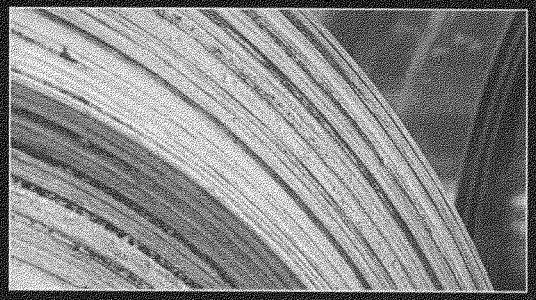
Melting Furnace and Casting



- Alloy compositions produced to secret recipes.
- Can customise composition to suit client requirements.

© The Royal Mint Limited 2012. All rights reserved

Strip Scalping and Rolling



- As part of our recycling policy, when strip scalping, all the waste swarf is returned back to the furnaces to minimise the requirement for virgin materials.
- The rolling mills run from 60 metres a minute up to 180 metres a minute and are controlled by a state-of-the-art gauge system.

© The Royal Mint Limited 2012. All rights reserved

Coil Annealing and Finish Rolling

- When it will produce a better end product, we will anneal the whole coil.
- One of the few mints in the world that can finish roll.
- A state-of-the-art computer controlled process gives accuracy and precision.

© The Royal Mint Limited 2012. All rights reserved

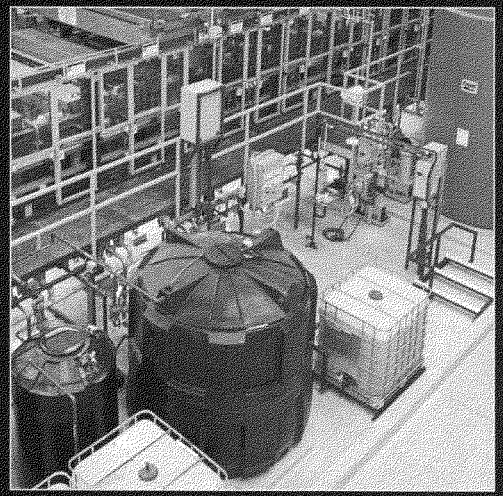
Blanking

When The Royal Mint supplies blanks to be struck elsewhere, it is ensured that they have been vision checked to remove blanks with even the smallest of blemishes.

© The Royal Mint Limited 2012. All rights reserved

Electroplating

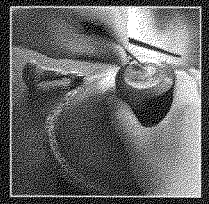
- We have 5 plating lines, plus a specialised prototype line.
- We can process 550 tonnes of product a week (the equivalent of around 6 jumbo jets a month).
- Unlike the majority of mints, The Royal Mint has clearance to use Cyanide. We use it in our copper plating process. It is the most efficient and effective way of plating copper.
- With our state-of-the-art equipment and our PhD qualified specialists we control and adjust the chemical composition of each bath in the plating process to exacting standards.
- The Royal Mint carries out nearly half a million checks just in the plating process every year.

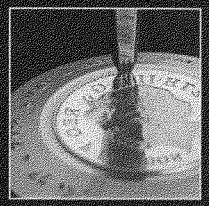


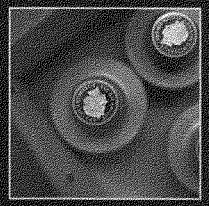
© The Royal Mint Limited 2012. All rights reserved

Tooling

- Techniques developed and logged for centuries.
- World class polishing techniques.
- State-of-the-art and custom-made machinery.
- Each tool is hand-worked at least 3 times. This improves the quality as well as making it harder to reproduce mechanically.
- Internationally recognised quality standards.
- PVD coating is used to protect the dies for circulation coins.
- The latest Teer coating process is used to protect the dies for commemorative coins.







© The Royal Mint Limited 2012. All rights reserved

Striking

- Our presses have patented design features that make them faster and more efficient.
- We have reduced our change-over times from 4 hours to just 20 minutes.
- We have the capacity to strike up to 750,000 pieces an hour. That's 12 a second.

© The Royal Mint Limited 2012. All rights reserved

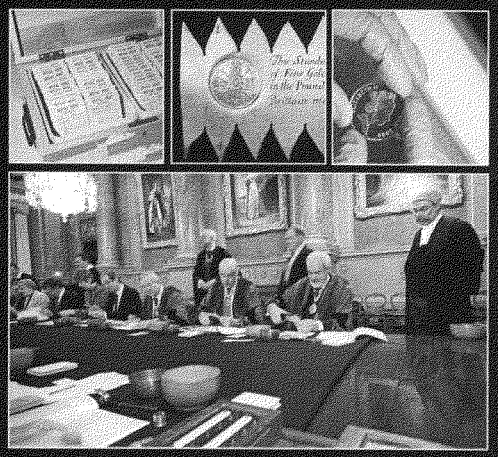
Edge Lettering and Coining

- In addition to standard edge lettering techniques, we can even edge letter in a groove – a specialised anti-counterfeiting technique.
- One of the few mints in the world that can edge letter in Arabic.

© The Royal Mint Limited 2012. All rights reserved

Quality control

- The Royal Mint became the first mint in the world to be accredited to the international quality systems standard ISO 9001 in November 1991.
- These quality systems are independently audited by the British Standards Institution (BSI) twice each year.
- Since 1248, The Royal Mint's work has also been submitted to additional independent rigorous testing carried out at the annual Trial of the Pyx.
- The Royal Mint has world-leading sample checking procedures.



Trial of the Pyx

© The Royal Mint Limited 2012. All rights reserved

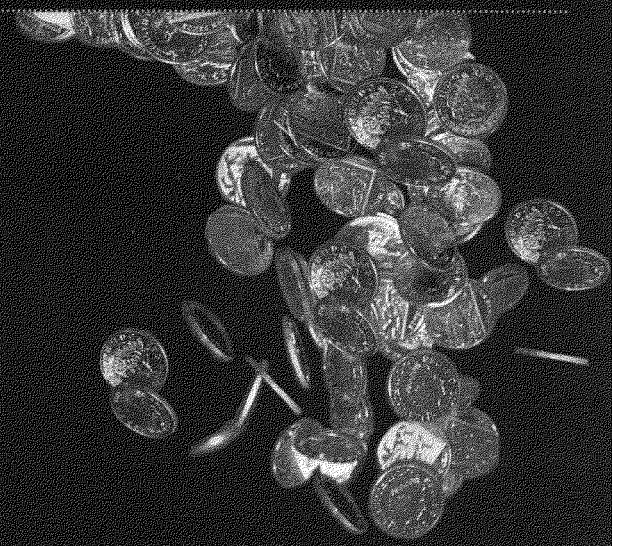
Packing and Distribution

- We can pack up to 250,000 pieces an hour.
- We can provide flexible packaging options.
- Our packaging is designed to suit the needs of your workforce, location and situation.
- We can even deliver right to your vault.

© The Royal Mint Limited 2012. All rights reserved

The Numbers

- We can strike up to 750,000 pieces an hour, that's 110,000,000 a week.
- Circa 1 billion UK coins are issued every year.
- On average we strike over 180 different denominations for customers around the world.
- 9 days from blanking to warehouse.
- We carry out nearly half a million checks just in the plating process every year.



© The Royal Mint Limited 2012. All rights reserved

Awards

- We were the first mint in the world to hold the SA8000 safety standard and also hold the international quality systems standard ISO 9001.
- We currently hold environmental awards from the Welsh Government and ISO 50001, a voluntary international standard for energy management.
- We won the Manufacturer of the Year Award – 2011.
- Made in Wales - 2011 Winner of 'Manufacturing Innovation' Award.
- Green Apple - we won the 2011 award for 'Environmental Improvement and Sustainable Development'.

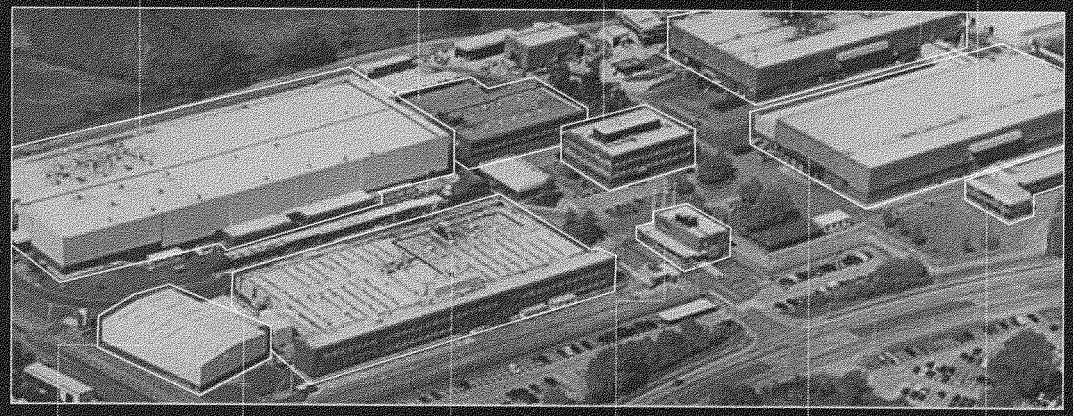
© The Royal Mint Limited 2012. All rights reserved

Services

© The Royal Mint Limited 2012. All rights reserved

Integrated Site

The largest fully integrated export mint in the world.



© The Royal Mint Limited 2012. All rights reserved

Technical Services

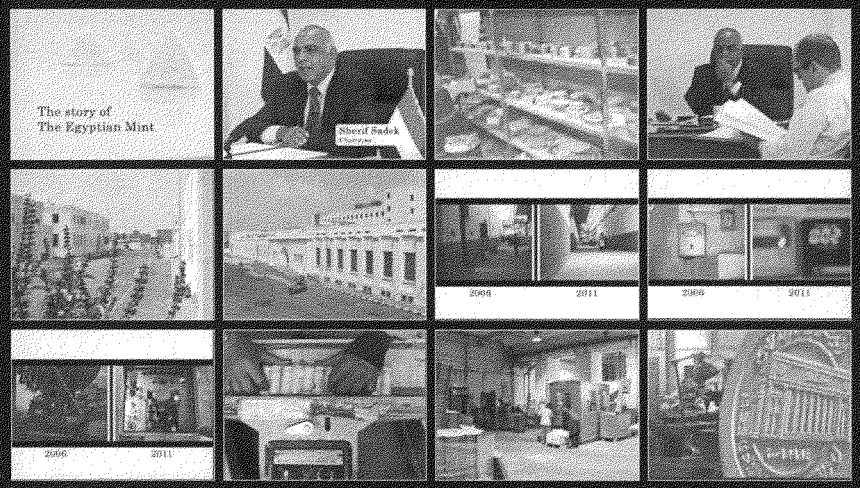
The Royal Mint can help you with:

- Setting up a mint from scratch
- Tooling
- Efficiency
- Manufacturing
- Packaging
- Design
- Training
- Product development
- Project management
- Specifications consultancy

The Royal Mint can supply you with engineers, engravers, technical support, or even the Head of Production and Head of Engineering.

© The Royal Mint Limited 2012. All rights reserved

The Egyptian Mint



© The Royal Mint Limited 2012. All rights reserved

The Egyptian Mint

© The Royal Mint Limited 2012. All rights reserved

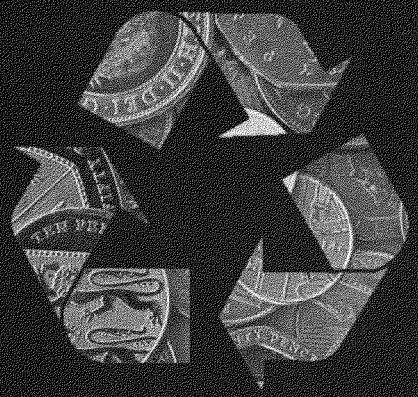
Technology Group

- Overt security (design).
- Covert security (alloys, plating choices).
- Anti-counterfeit activities with police and security entities.
- Improved manufacturing processes.
- Enhanced yields through technology developments.
- Innovation in coinage.
- Cost-optimised products.

© The Royal Mint Limited 2012. All rights reserved

Legacy and Recycling

- Can help collect, dispose and recover the metal value of old withdrawn and demonetised coins. This will help:
  - Offset the cost of new coin
  - Relieve pressure on vault space
  - Allow stock build prior to the changeover
- The Royal Mint's manufacturing processes have a recycling rate of up to 80%.

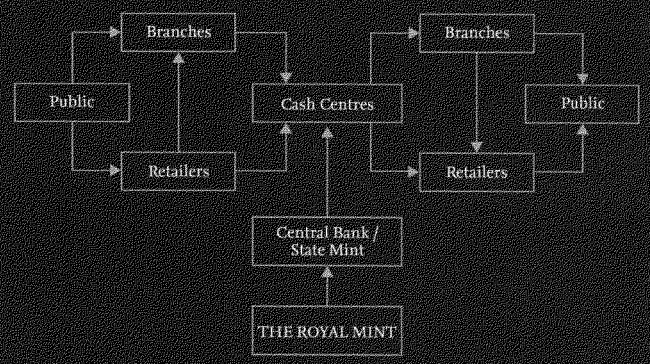


© The Royal Mint Limited 2012. All rights reserved

Cash Management System Consultancy

The Royal Mint has extensive experience and understanding of the Cash Management Cycle, offering bespoke solutions to maximise the availability of cash in terms of:

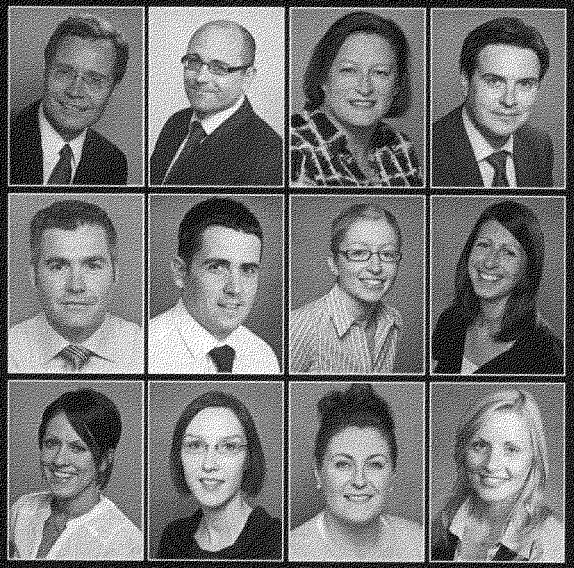
- Cash supply chain
- Flow and re-flow through the cash system
- Controlled disbursement
- Handling and sorting
- System transparency
- Forecasting cash requirements



© The Royal Mint Limited 2012. All rights reserved

Customer service

- Dedicated account managers.
- Full service consultancy and advice.
- After sales service and care.



© The Royal Mint Limited 2012. All rights reserved

Procurement

- Environmental, sustainable and efficient awarding-winning supply chain and procurement processes.
- Strategic relationship management.
- Systems and processes all fully integrated.
- Engagement with partners and supply chain at all levels.

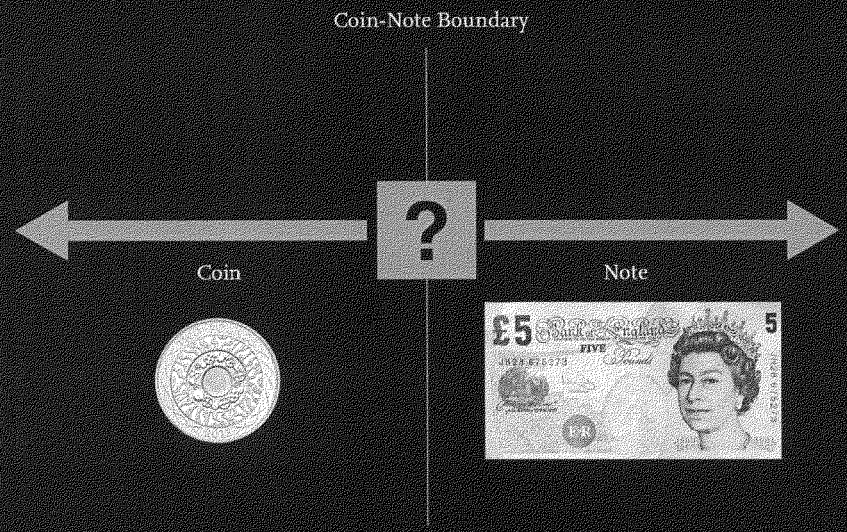
© The Royal Mint Limited 2012. All rights reserved

Why a coin?

- A coin can be produced to last 25+ years.
- aRMour full-plate is the most cost-effective and durable product in the world.
- Coins are cheaper in the medium to long-term.
- US congress recommendation.
- Charities prefer coins.
- Coins have an pre-existing infrastructure.
- True seigniorage.
- Proven security features.

© The Royal Mint Limited 2012. All rights reserved

Coin–Note Boundary



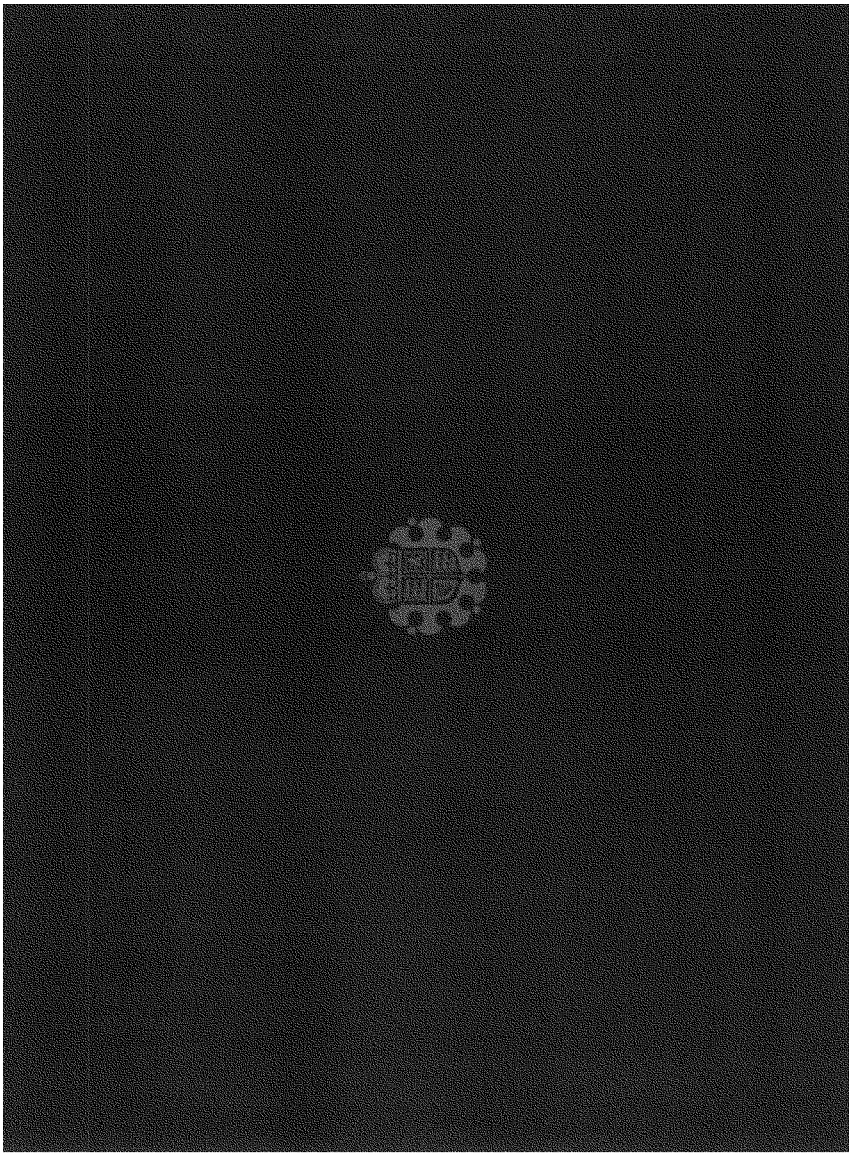
© The Royal Mint Limited 2012. All rights reserved

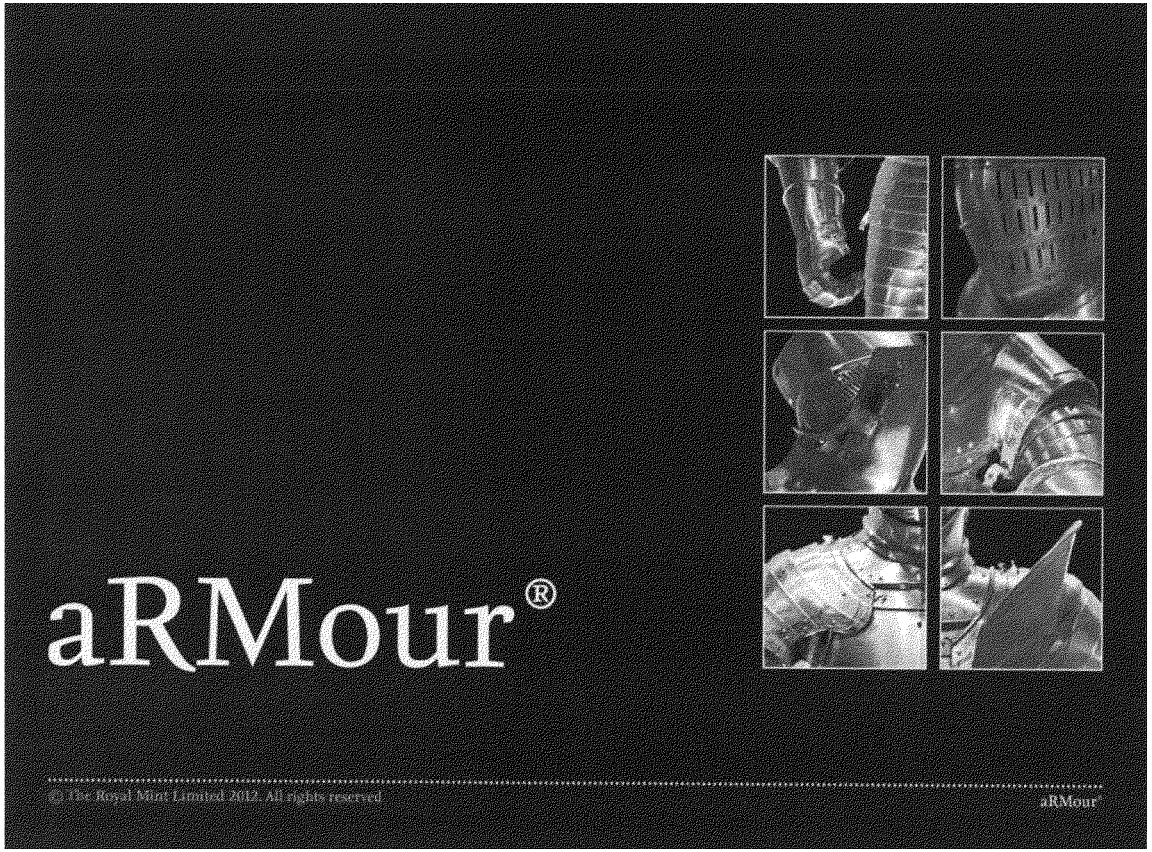
References

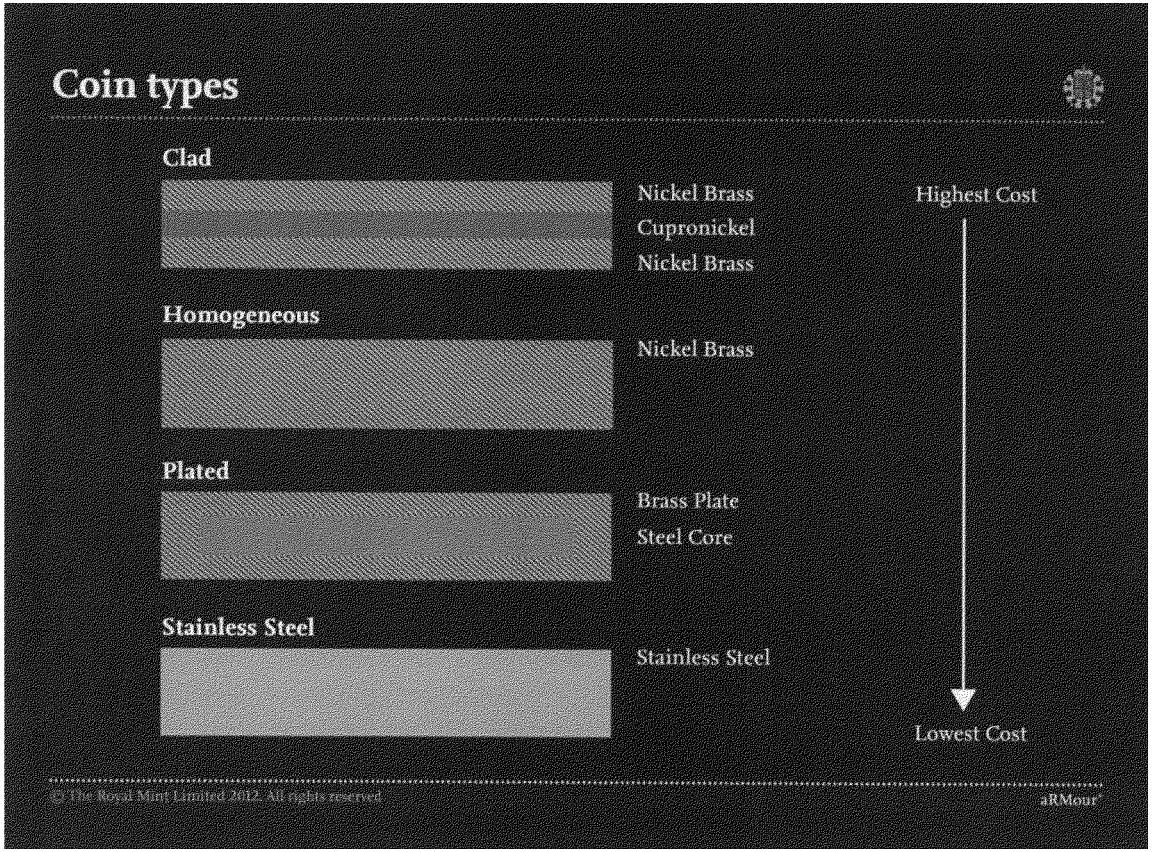
Upon request we can supply references from customers, for example:

- Bank of Mozambique
- Reserve Bank of New Zealand
- Egyptian Mint Authority
- Central Bank of Kenya
- Central Bank of Bosnia and Herzegovina
- Croatian National Bank
- Central Bank of Jordan
- Czech Mint
- Central Bank of Sri Lanka
- Bank of Jamaica
- Central Bank of Uruguay
- Croatian Monetary Authority
- Cayman Islands Monetary Authority
- States of Jersey Treasury
- Falkland Islands Treasury
- Macau Monetary Authority
- Central Bank of Trinidad and Tobago

© The Royal Mint Limited 2012. All rights reserved

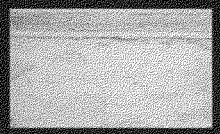



aRMour®
© The Royal Mint Limited 2012. All rights reserved
aRMour®


Coin types
Clad
Nickel Brass
Cupronickel
Nickel Brass
Homogeneous
Nickel Brass
Plated
Brass Plate
Steel Core
Stainless Steel
Stainless Steel
Highest Cost
Lowest Cost
© The Royal Mint Limited 2012. All rights reserved
aRMour

Plating

Multi-Plate



Nickel (6-8 microns)
Copper (10-12 microns)
Nickel (6-8 microns)

Steel

Three layers of plated material onto a steel core

Dual-Plate

Nickel (6-8 microns)
Copper (10-18 microns)

Steel

Two layers of plated material onto a steel core

Full-Plate (aRMour)

Nickel (25 microns)

Steel

Single layer of metal plated onto a steel core

© The Royal Mint Limited 2012. All rights reserved

Plating - the benefits of full-plate

Unlike full-plate, both dual-plate and multi-plate top layers quickly thin to reveal the red copper layer.

Plating Type:		After 4 years in circulation	Uncirculated
Multi-plate	Three layers of metal plated onto a steel core		
Full-plate (aRMour)	Single layer of metal plated onto a steel core		

©The Royal Mint Limited 2012. All rights reserved

aRMour

Plating - press article

The Daily DEMOCRAT

ISSUE NO. 0569 TUESDAY 1ST JUNE, 2010 PRICE 70¢

PESEWA COINS RUSTING

50 & 20 GHp Worse Affected

By Solomon Davids

With barely three (3) years in circulation, most of the pesewa coins are rusting, forcing some members of the public to reject them as legal tender.

The Daily Democrat's survey across the capital indicates the coins, mostly the 50 and twenty pesewas, do not look as good as they were not because of misuse but apparently due the low quality of materials used.

(continued on page 3)

PESEWA COINS RUSTING

- "Barely three years in circulation"
- "Most are rusting"
- "Public reject them as legal tender"
- "Not because of misuse"
- "Due to the low quality of materials used"
- "Silver colour fading fast"

© The Royal Mint Limited 2012. All rights reserved

aRMour

Plating - the facts

- The Royal Mint uses both acid and alkaline plating technologies, including cyanide. Cyanide is more efficient for copper plating as it uses half the energy compared to acid.[1]

- The Royal Mint is fully compliant with all relevant UK and European legislation concerning health, safety and the environment. We were the first mint in the world to hold the coveted SA8000 social accountability standard and also hold the international quality systems standard ISO 9001. In addition to these, we have held ISO 14001, the environmental management standard, since 2005.[2]

- With multi-layer plated coins, the combination of thin plated layers tends to have a large plating thickness tolerance. This tolerance can produce a large variability in the sensor readings.[3]

- The plating thickness on multi-layered plated coins tends to be inconsistent which can affect the material sensors.[4]

- Copper is a cheaper material than nickel.[5]

Sources:

1. Canning's Handbook: surface finishing technology, Edition 23, Publisher W. Canning plc., 1982, ISBN 0419129006, 9780419129004
2. SA 8000:2008 Certificate No: GB10/80439
   ISO 9001:2008 Certificate No: FM 13962,
   ISO 14001:2004 Certificate No: EMS 84940
3. EVA handbook 2012, page 30
4. EVA handbook 2012, page 30
5. http://www.lme.com

© The Royal Mint Limited 2012. All rights reserved

aRMour™

aRMour® full-plate

aRMour full-plate is a single plated layer, usually of 25 microns.

Benefits include:

- Higher quality
- Increased security
- Lifetime cost savings
- Increased seigniorage
- Reduced risk of end-user smelting

© The Royal Mint Limited 2012. All rights reserved

aRMour® full-plate

aRMour full-plate:

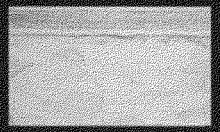
- Is a single layer of material that is electroplated directly onto the steel core.
- Is a thick layer of plating, usually of 25 microns.
- Offers superior durability and finish.

Benefits include:

- Higher quality
- Increased security
- Lifetime cost savings
- Increased seigniorage
- Reduced risk of end-user smelting

© The Royal Mint Limited 2012. All rights reserved

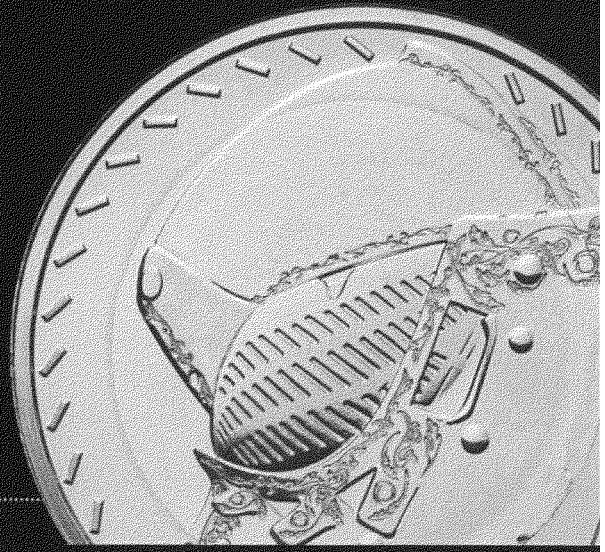
aRMour® full-plate

Plating Type:	Microscopic view:	Lifetime:	Outer layer:	Comment:
Multi-plate		3 - 8 years	3 - 8 microns	Triple layer, top plate layer is thin (6-8 microns), which can wear down to reveal the red copper layer sooner than full plate under the same conditions.
Dual-plate		3 - 8 years	3 - 8 microns	Dual layer, top plate layer is thin (6-8 microns), which can wear down to reveal the red copper layer sooner than full plate under the same conditions.
Full-plate (aRMour)		25 years	25 - 30 microns	aRMour - Single layer, (typically 25 microns) of full plate which demonstrates superior durability with strong bonding of plate to steel.

© The Royal Mint Limited 2012. All rights reserved

aRMour® - why switch?

- Raw material savings in excess of 50%
- Increased seignorage
- Proven longer lifetime
- Co-circulation of coins is possible
- Range of proven security features



© The Royal Mint Limited 2012. All rights reserved

Full-plate - the popular choice

Adopted by over 100 countries, full-plate is the internationally recognised standard for plated coins and blanks.

© The Royal Mint Limited 2012. All rights reserved

aRMour™

aRMour®

aRMour is currently in circulation in over 50 countries.

© The Royal Mint Limited 2012. All rights reserved

Independent coin-wear test - Fraunhofer

Fraunhofer are the world's largest independent research organisation. Over a 6 month period, Fraunhofer developed an independent, coin-wear test method and analysed hundreds of coins from all over the world.

Two key findings:

- Typically, plated steel core coins wear at 1 micron per year in circulation. Including multi-plate, dual-plate, and full-plate coins.

- Full-plate coins hold a longer circulation lifespan, as the plated layer is thicker than dual and multi-plate coins.

Fraunhofer

© The Royal Mint Limited 2012. All rights reserved

aRMour™

Security

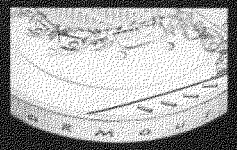
aRMour plating technology enables the following security features:

- Milled edges
- Latent features and semi holograms
- Shapes – square, scalloped, multi-sided
- Edge lettered incuse (with or without milling)
- Edge lettered with raised letters or beads in a groove
- Choice of alloy or material
- Alternately plain and milled edge
- Bi-colour homogeneous or plated materials or a combination of both
- Clear designs with good clear detail. E.g. micro-dots or micro-lettering
- Designs which cover the majority of the flat surface

© The Royal Mint Limited 2012. All rights reserved

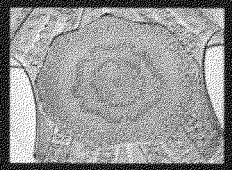
Security features

Edge Lettering



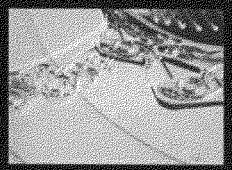
Text impressed into the coin edge

Latent Feature



Reveals 2 different images as angle is changed

Fine Engraving



Similar to the lines used on banknotes

Micro-dots and Micro-lettering

Dots or symbols positioned at precise location

Beading

Raised beads in a groove around the coin's circumference

Groove Raised Lettering

Raised lettering in a groove around the coin's circumference

Bi-colour or Bi-metallic Coins

Two composite parts are struck together creating a secure bond

Shape

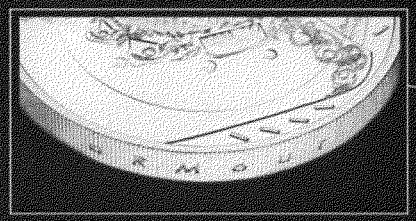
Quick public recognition

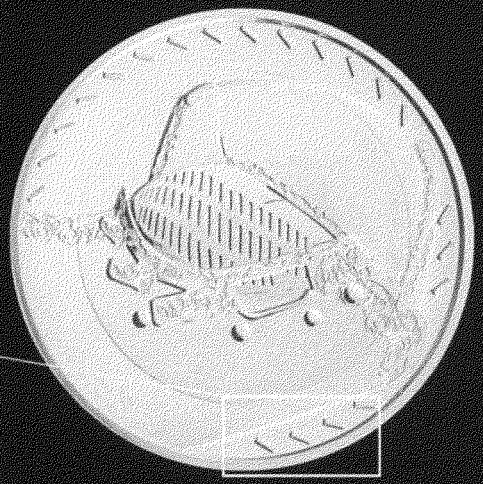
© The Royal Mint Limited 2012. All rights reserved

aRMour

Edge lettering

A security feature where letters run around the edge of a coin. The letters are formed into the edge of the coin prior to striking. This is a technically complex process and as a result very difficult to counterfeit.





© The Royal Mint Limited 2012. All rights reserved

aRMour

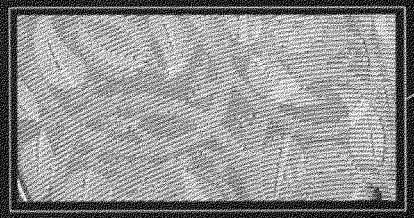
Semi hologram or latent image

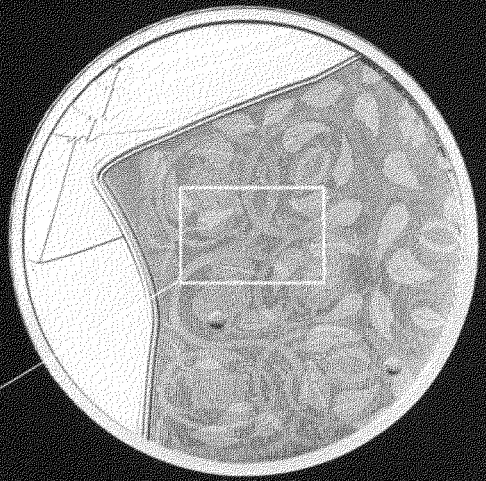
A high-tech security feature struck into the coin design that significantly deters counterfeiting.

An intricate and detailed pattern is cut expertly into the coin tooling.

The result is an intricate and secure design on the coin that moves and changes when the coin is tilted.

It provides the public with a quick and easy anti-counterfeit test and reassurance of the coin's integrity.



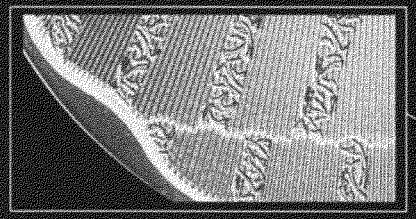


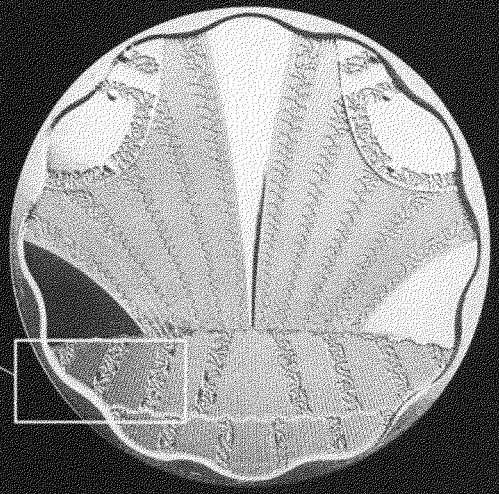
© The Royal Mint Limited 2012. All rights reserved

aRMour

Fine engraving

Fine engraving delivers a security feature similar to that seen on banknotes, with the added benefit of 3D design.



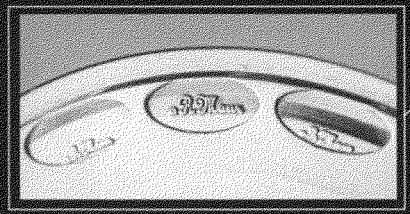


© The Royal Mint Limited 2012. All rights reserved

aRMour

Micro-dots or micro-lettering

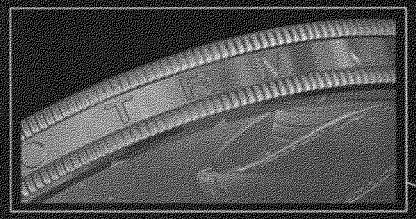
Micro-dots or micro-lettering form a detailed pattern which can be accurately measured and is difficult to replicate or counterfeit. The patterns formed during the striking stage can be raised or incuse.

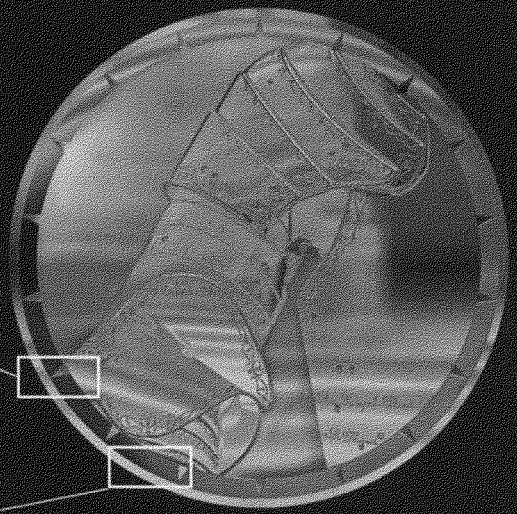


© The Royal Mint Limited 2012. All rights reserved

Raised edge lettering and beading in a groove

This feature offers a high level of visual security and is extremely difficult to replicate or counterfeit. This security feature was developed within The Royal Mint to provide a significant enhancement in on-going overt coinage security.





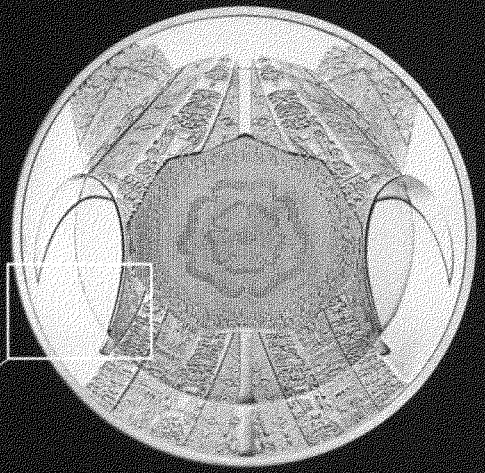
© The Royal Mint Limited 2012. All rights reserved

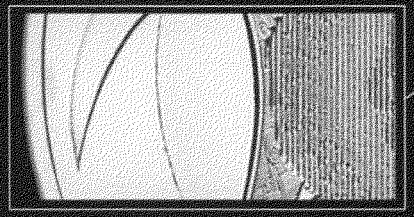
aRMour

Bi-colour or bi-metallic

Two composite parts, an inner and outer, are struck with extreme force joining them in a secure bond.

This process requires state of the art coin presses and machinery as well as skilled operators, therefore bi-metallic coins are very difficult to counterfeit.





(c) The Royal Mint Limited 2012. All rights reserved

aRMour

Shape

Coins can be almost any shape.

Round is a common shape as it has no sharp edges and is ideal for automated systems such as vending and reprocessing.

Round

Square

Lobed (Seven Sides)

Multi Sides

Scalloped

Bi-Metallic

© The Royal Mint Limited 2012. All rights reserved

Vending - exact change only?

Currently, coin validators check a coin's material using different electro-magnetic frequencies to determine its validity.

- **High frequencies** do not penetrate into the core of the coin and are therefore sensitive to the surface material.
- **Lower frequencies** penetrate deeper into the coin and are therefore sensitive to both surface and core material.

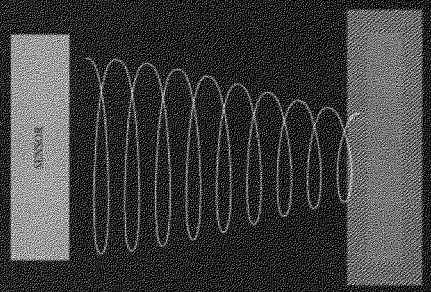
© The Royal Mint Limited 2012. All rights reserved

aRMour

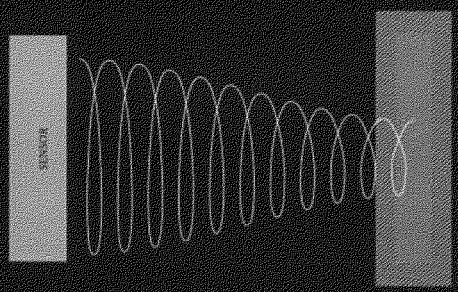
Vending - exact change only?

Currently, coin validators check that a coin is genuine by examining it using electronic sensors set at different frequencies.

- The sensors can distinguish the coin's diameter, thickness, shape and material.
- The coin is examined at both high and low frequencies, to establish its electro-magnetic signature (EMS).
- Full-plate offers the most secure options for electro-plated coinage.



High frequencies examine the coin's surface



Low frequencies examine deeper into the coin's core

© The Royal Mint Limited 2012. All rights reserved

aRMour™

Weight and dimension

Weight, diameter and blank thickness are all variable. Fixing two will determine the third.

Eg. Formula to determine weight:

$$\text{Weight} = \pi \times \frac{\text{Diameter}^2}{4} \times \text{Blank Thickness} \times \text{Density}$$

© The Royal Mint Limited 2012. All rights reserved

Options

Electroplated steel coins are cost effective to produce and increasingly popular.
There are 3 main types of electroplated materials used with a mild steel or alloy core.

Materials Available in 3 broad shades:	**Colours** (or a combination of any of these for bi-colour)
Copper	Copper (red)
Nickel	Silver (white)
Brass	Gold (yellow)

© The Royal Mint Limited 2012. All rights reserved

aRMour

Options

Some example compositions:

Materials	Colour		Composition	
Nickel Brass (4%)	Yellow	(Gold)	Cu Zn Ni	76 20 4
Nickel Brass (5.5%)	Yellow	(Gold)	Cu Zn Ni	70 24.5 5.5
Brass	Yellow	(Gold)	Cu Zn	70 30
Aluminium Bronze	Yellow	(Gold)	Cu Al Ni	92 6 2
Brass-Plated Steel	Yellow	(Gold)	Fe Cu Zn	94 4.8 1.2
Cupronickel	White	(Silver)	Cu Ni	75 25
Nickel Silver	White	(Silver)	Cu Ni Zn	60 20 20
Stainless Steel	White	(Silver)	Fe Cr	82 18
Aluminium	White	(Silver)	Al Mg	98 2
Nickel-Plated Steel	White	(Silver)	Fe Ni	94 6
Coinage Bronze	Red	(Bronze)	Cu Zn Sn	97 2.5 0.5
Copper-Plated Steel	Red	(Bronze)	Fe Cu	94 6

© The Royal Mint Limited 2012. All rights reserved

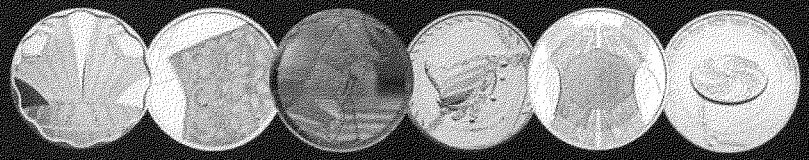
Summary

aRMour® from The Royal Mint gives you the ultimate choice in plated coins and coin blanks:

- Security
- Design
- Colour
- Shape

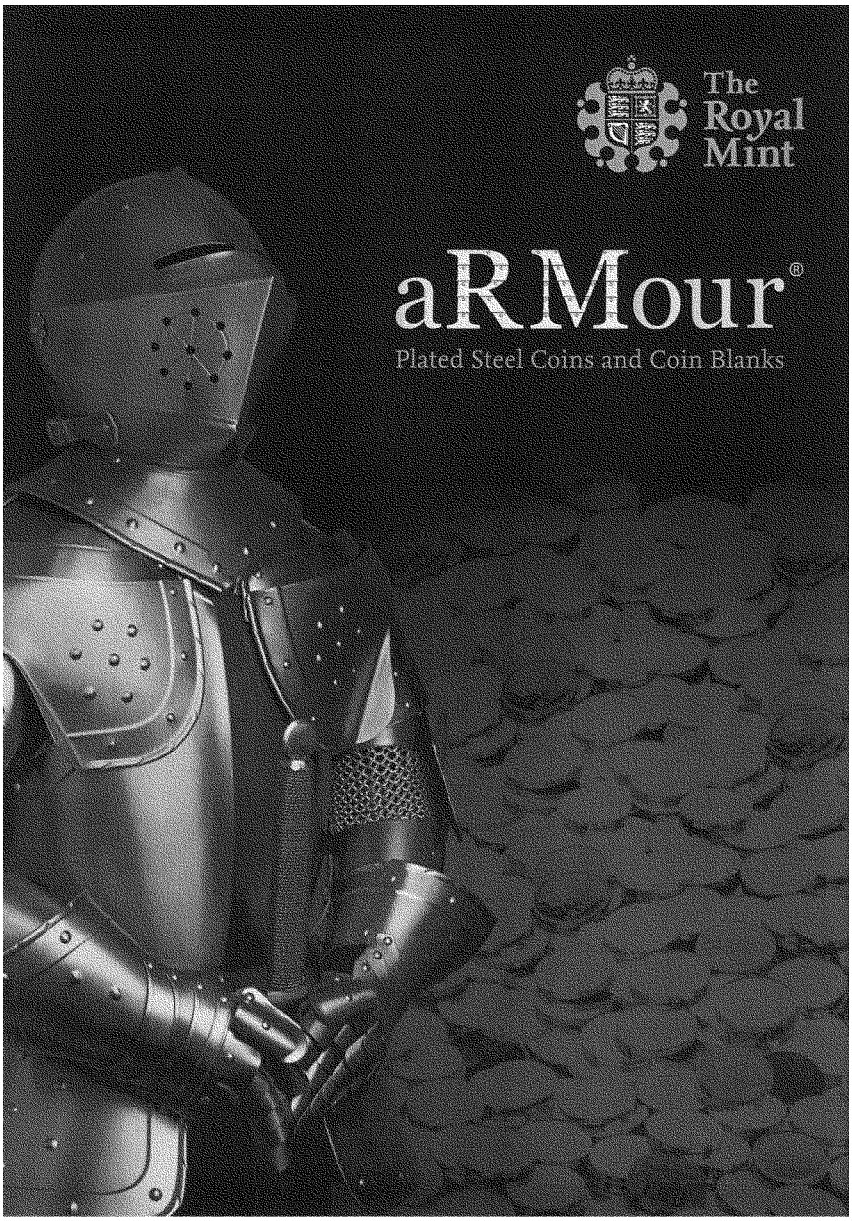
without compromising cost, quality, durability or value for money.

Already in circulation in over 50 countries, aRMour® will protect your coinage, now and for the future.



© The Royal Mint Limited 2012. All rights reserved

© The Royal Mint Limited 2012. All rights reserved
RMint


The Royal Mint
aRMour®
Plated Steel Coins and Coin Blanks

The Royal Mint
Making Money for Everyone™

The Royal Mint is the world's leading export mint with around 50 countries procuring their circulation coin and coin blank requirements from us each year.

As raw material costs increase, more and more countries are choosing electroplated coins and blanks, which offer significant advantages over homogeneous products.

aRMour® from The Royal Mint is a superior plating process suitable for coins and coin blanks. It offers a variety of benefits compared to other coin and blank products, including covert and overt security features, increased seigniorage, significant cost savings and exceptional wear-resistance which leads to a long lifetime in circulation. These qualities combine to give second-to-none cost of ownership, making aRMour the first choice for coins and coin blanks.

aRMour full-plate technology is available in Nickel-Plate, Copper-Plate and Brass-Plate, for mono-, bi- and tri-colour coins and blanks.

Full-Plate
Technology

Full-plate technology is the internationally recognised and accepted standard for plated coins and coin blanks. Countries and Issuing Authorities across the world have adopted this method of plating, including:

– United Kingdom
– Eurozone
– USA
– China
– South Africa
– Russia

aRMour full-plate is a single layer of material, usually 25 microns, that is electroplated directly onto the steel core, which results in a very strong bond between the plated material and the steel core. aRMour coins and blanks have typical lifetimes of 25-30 years in circulation.

The ductility and composition make aRMour blanks the superior choice for striking high quality finished coins.

Nickel and brass full-plate coins and blanks can be recycled and the reclaimed metal sold on, so even at the end of their circulating life, or if the decision is taken to de-monetise, the coins and blanks can contribute to the cost of maintaining circulating coins or introducing new ones.

The Royal Mint works with approved third parties for the secure retrieval of legacy coins from circulation, and with customers to establish a mutually acceptable recovery programme. It is not possible to recover the materials used for dual-and triple-plated coins so this should be taken into consideration when evaluating cost of ownership.

www.royalmint.com

aRMour® Plated Steel Coins and Coin Blanks

Copper-Plated Steel

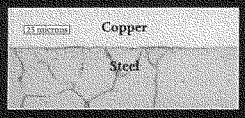
A replacement for bronze, copper and other similar coinage materials, aRMour Copper-Plated Steel Coins and Coin Blanks are bronze/red in colour.

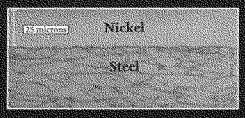
Nickel-Plated Steel

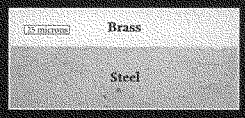
Silver/white in colour, aRMour Nickel-Plated Steel Coins and Coin Blanks have been designed to replace cupro-nickel or similar coinage materials.

Brass-Plated Steel

aRMour Brass-Plated Steel Coins and Coin Blanks are golden/yellow in colour and have been designed to replace homogeneous brass, nordic gold, nickel-brass, aluminium-bronze or other similar coinage materials.







aRMour Copper-, Nickel- and Brass-Plate is typically around 25 microns in thickness and as a result the coins and coin blanks usually have a circulating lifetime of 25-30 years. aRMour products can be supplied as struck coins or as coin blanks ready for striking.

Technical advice and consultation is available for the specification of coins and blanks, as well as design, tooling manufacture and packaging. The Royal Mint can provide expertise and recommendations; our technical team works with mints and central banks across the world to ensure that our customers receive the best possible coins and blanks for their requirements.

The Royal Mint is renowned for its first-class customer service from initial query through to delivery, and after-sales care from dedicated Account Managers gives customers full support throughout the currency procurement process.

For further information about aRMour Plated Coins and Coin Blanks from The Royal Mint, please contact us via the details overleaf.

The Benefits of aRMour®

Superior quality from the world's leading mint

The Royal Mint is the first choice supplier to around 50 countries every year, and uptake of aRMour Plated Coins and Coin Blanks has grown since their introduction in 1983.

Low cost manufacturing, lasting quality

Compared with homogeneous coins or blanks, aRMour Plated Coins and Coin Blanks result in significant cost savings and usually last 25-30 years in circulation.

High process yields

The aRMour plating process employs fewer steps than other plating techniques and offers very high process yields, with highly efficient and consistent quality across orders of millions of coins or blanks.

Proven quality and supply

The Royal Mint has a recognised track record of supply, quality and on-going technical support. Accreditations ISO 9001, ISO 14001, ISO 50001 and SA8000 demonstrate commitment to quality, environment, energy management and a safe workplace.

Superior wear and corrosion resistance

One of the key benefits of aRMour compared to other plated products for circulation coins and coin blanks is the superior wear resistance, which supports a long lifetime in circulation.

World class manufacturing capacities

Large-scale production facilities on a single secure site are capable of meeting our customers' capacity requirements. On-going capital investment ensures that increasing demand for aRMour products will not compromise quality or delivery.

A Wide Range of Security Features

aRMour Coins can incorporate a superior range of security features that can be tailored to suit customers' needs and budgets. A wide variety of security options is available to deter counterfeiting activity.

From latent features and edge lettering, to beading and lettering within a groove, and many other possibilities, the diversity of security options available is far greater than that provided by other suppliers.

Comparison of Plated Coins and Coin Blanks

Fraunhofer is Europe's largest application-oriented research organisation and has more than 18,000 employees worldwide. Over a six-month period, Fraunhofer developed an independent coin wear test method and analysed hundreds of coins from all over the world. The key findings of Fraunhofer's research show that:

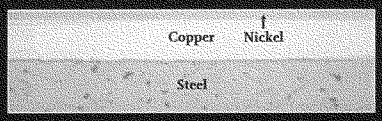
– All nickel coins wear at 1 micron per year in circulation, including multi-plate, dual-plate, full-plate and solid coins.
– Full-plate coins hold a longer circulation lifespan, as the plated layer is thicker than dual- and multi-plate coins.

Fraunhofer

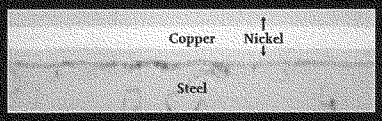
Comparison of Types of Plate

aRMour full-plate technology from The Royal Mint. One layer of nickel is electroplated directly onto the steel core, ensuring that the external layer is securely bonded. The thickness of the plate, typically around 25 microns, delivers a market-leading lifetime in circulation of 25-30 years.

Dual-plate technology combines a layer of copper that is electroplated onto the steel, and a layer of nickel is then added. In this situation, the thin layer of nickel can be just six microns, which will, on average, wear down to reveal the copper layer underneath within six years.



Multi-plate or triple-plate consists of three layers of plate, usually nickel on copper on nickel. As seen with dual-plate, and as Fraunhofer concluded, the thin top layer of nickel can wear at a rate of one micron per year, resulting in the coins looking 'rusty' and having a short lifetime in circulation.



Kenyan 1 shilling produced via the aRMour® process showing one circulated coin retrieved in September 2009 (left) and one uncirculated coin (right). Both produced in 2005.

Coins not shown to actual size.

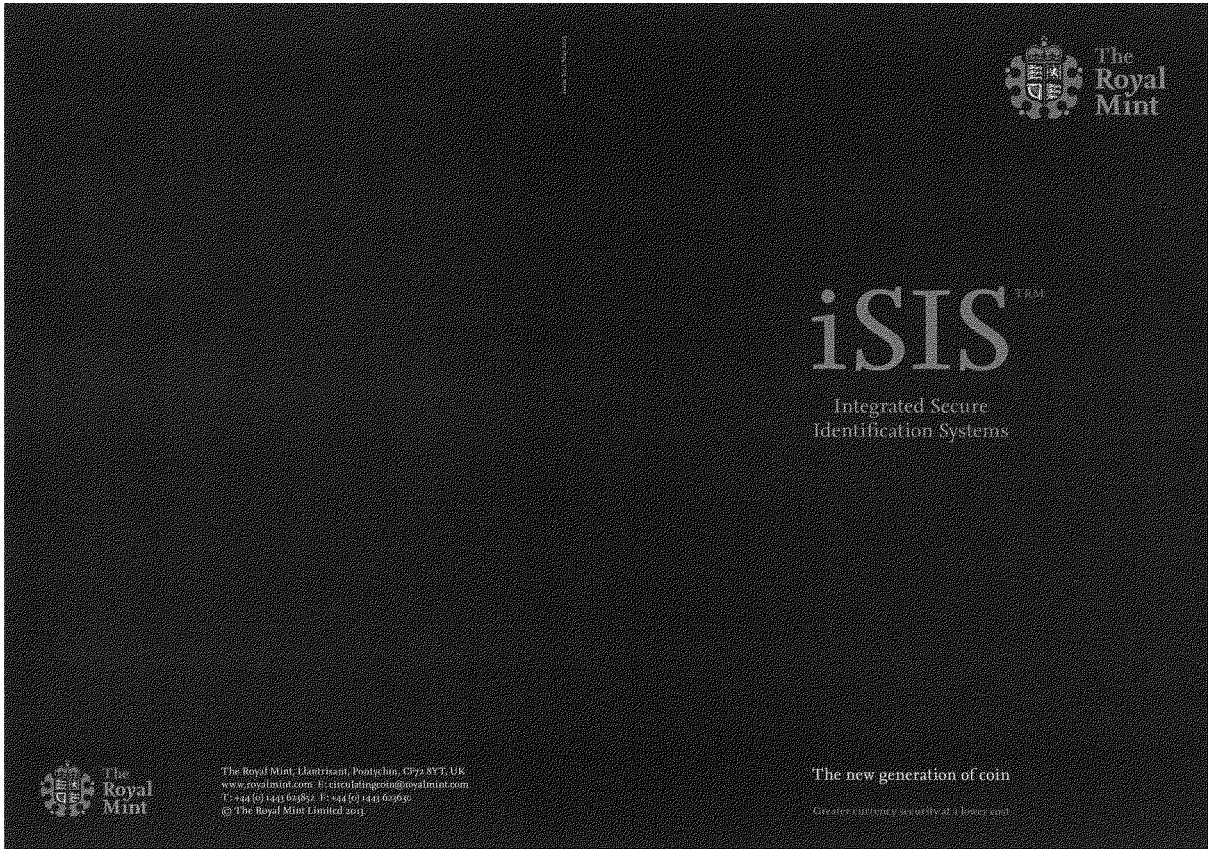
Ethiopian 50 cent produced via the multi-plate process showing one circulated coin retrieved in September 2009 (left) and one uncirculated coin (right).

Both produced in 2004/2005. The circulated coin shows significant wear with the underlying copper layer showing through, which indicates a potentially short lifetime in circulation.

Issue No. 3 April 2013

The Royal Mint, Llantrisant, Pontyclun, CF72 8YT, United Kingdom
Web: www.royalmint.com Email: armour@royalmint.com
Tel: +44 (0) 1443 623852 Fax: +44 (0) 1443 623630

© The Royal Mint Limited 2013


The Royal Mint
iSIS™
Integrated Secure
Identification Systems
The new generation of coin
Greater currency security at a lower cost
The Royal Mint
The Royal Mint, Llantrisant, Pontyclun, CF72 8YT, UK
www.royalmint.com E: circulatingcoin@royalmint.com
T: +44 (0) 1443 622852 F: +44 (0) 1443 623636
© The Royal Mint Limited 2011

Introducing

iSIS™ Integrated Secure Identification Systems

A new generation of coin with three levels of banknote-strength security – overt, covert and forensic – built in.

The iSIS currency system can be authenticated via high-speed automated detection at industry-leading levels and is harder to counterfeit and easier to detect than any coin before it.

There are additional customer benefits to iSIS:

- It will reduce costs by replacing expensive clad and homogeneous coins with a more affordable full-plated option.
- It will generate lifetime cost savings through unmatched durability, lasting up to 30 times longer than an equivalent value banknote.
- It will have considerably lower replacement frequency than other plated coin types.
- Both robust and secure, its issuance protects the reputation of a country, projecting a positive image of the nation and its economy.

The three levels of banknote-strength security offered by iSIS enable issuance authorities to develop their cash management system as appropriate, and as such The Royal Mint offers bespoke solutions to maximise the availability of cash.

iSIS is backed by the quality, choice and flexibility that are the hallmarks of The Royal Mint, ensuring a cost-effective currency system that meets each customer's market needs without compromising on finished product.

Low cost of ownership

With metal prices and production costs rising globally, our state-of-the-art full-plating technology delivers:

- **Greater cost savings** over clad and homogeneous coins.
- **Increased seigniorage**

In addition to introducing coins that have increased seigniorage compared to alternatives, The Royal Mint works with customers to achieve the secure retrieval of legacy coins from circulation, and to establish a mutually acceptable recovery programme. This provides a new revenue stream that can actively support the introduction of new coins throughout the currency system.

Lifetime savings

Using techniques developed for aRMour®, The Royal Mint's full-plate coins and coin blanks, iSIS provides unmatched lifetime savings over traditionally clad and homogeneous coins and equivalent value banknotes. It delivers:

- **Unequalled durability**, with full-plate technology producing a coin that lasts considerably longer than other coins and up to 30 times longer than an equivalent value note.
- **Superior wear and corrosion resistance**, with full-plate proven to last longer than alternative plated products[1].
- **Reduced whole life costs**, with the coin's durability dramatically reducing its replacement frequency.

iSIS is not just a superior quality coin, it's a full end-to-end currency system from specification and production to cash cycling, detection, validation and removal; that has all the necessary strengths to carry the reputation of a nation and its economy. The iSIS currency system can be applied as appropriate at various levels of the Cash Cycle: from Central Bank to Cash Centres to Vending and Point of Sale.

Currency credibility

iSIS delivers the security standards of a banknote in a cost-effective coin format. It can actively protect a currency against counterfeiting and safeguard the integrity of the Central Bank through its:

- **Robust and proven detectability**, authenticated via high-speed automated detection and validation systems.
- **Three levels of security**, combining overt (such as edge lettering and latent images), covert (e.g. Electro Magnetic Signature) and for the first time in coinage, forensic security.
- **Proven credibility**, with The Royal Mint seal of quality and unrivalled expertise in cash system specifications and design, coupled with its position as the world's leading export Mint.

[1] Source: Innovalloy, Europe's largest independent research organisation. Over a six-month period, Innovalloy developed 20 independent coins and then replicated and analysed hundreds of coins from all over the world.

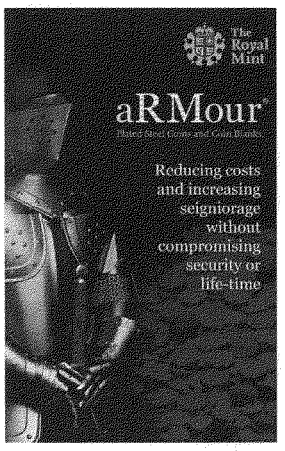
[2] Source: Innovalloy

- Typically, all steel based coins, such as the Swedish 50 pence in circulation, including nickel-plate, steel-plate, and full-plate coins.
- Full-plate coins feed a longer circulation lifespan, as the plated layer is thicker than clad and nickel-plate coins.

Where to find us next

Senior Executives from The Royal Mint will be delegates at key conferences across the world over the coming months. If you'd like to meet our representatives at any of the events below, please do either call us on +44 (0) 1443 623852 or email us at circulation@royalmint.com

Event	Location	Date
Banknote Conference	Washington	April 2014
Mint Directors Conference	Mexico City	May 2014
Coin Management Training Programme	Llantrisant	June 2014
AFCHAMS	Lagos	June 2014
African Banknote Conference	Cape Town	November 2014
World Money Fair	Berlin	February 2015
Currency Conference	Vancouver	May 2015



The new UK £1 coin - modern technology with a historical twist

The proposed new £1 coin represents a great success for UK science and manufacturing. The new, world leading ISIS technology has been entirely developed in-house at The Royal Mint's headquarters in South Wales.

The new coin also pays a fitting tribute to Britain's heritage. It is the same shape as the 12-sided "threepenny bit", which was in circulation from 1937 until decimalisation in 1971. The threepenny bit was in the final group of coins ever to feature the portrait of HRH Queen Elizabeth II, who last year celebrated 60 years on the throne.

The threepenny bit was the first British coin to use a 12-sided shape which enhanced its popularity during the Second World War, as its distinctive size and shape made it the easiest coin to recognise during the blackout.

The Royal Mint used the cutting edge technology of the time to safeguard the new threepenny bit - a new yellow nickel-brass alloy invented a few years earlier by The Royal Mint and not previously used for the coinage of the United Kingdom.

The current £1 coin has been in circulation for over thirty years, with many coins from the introductory year still circulating today. It replaced the much-loved £1 banknote in 1983 as it had become apparent that with the general decline in purchasing power, the £1 unit of currency was more appropriate to a coin than a banknote. The banknote was in constant use, on average lasting only nine months. A coin can last as long as forty years or more and with the growth in the vending industry it was felt that a coin would be more useful.

After consultation with many groups including retailers and special interest groups, the UK Government announced on 31 July 1981 that a new £1 coin that was to be issued on 21 April 1983. There are currently over 1.5 billion £1 coins in circulation in the UK.

As with all UK coins, the obverse of the £1 features the Queen's effigy. The reverse designs represent the United Kingdom and its four constituent parts - Scotland, Wales, Northern Ireland and England. Themes include capital cities, floral designs, iconic bridges and pathways, and heraldic emblems.

The Royal Mint, Llantrisant, Pontyclun
CF72 8YT, United Kingdom
Tel: +44 (0) 1443 623852
Fax: +44 (0) 1443 623879
Email: circulation@royalmint.com
www.royalmint.com/circulating

The Royal Mint

© The Royal Mint Limited 2014

COIN PRESS

A NEW £1 COIN SPECIAL EDITION

The Royal Mint

Spring 2014

For more information on any of the products or services offered by The Royal Mint, please contact us using the details on the back page.

New UK £1 coin to be "the most secure coin in the world"

The UK Government has announced that it will introduce a new £1 coin, which will be the most secure coin in circulation in the world. The new UK £1 will be a pioneering new coin which helps to dramatically reduce the opportunities for counterfeiting, helping to boost public confidence in the UK's circulating coins.

The Royal Mint has produced a prototype for a replacement £1 coin that utilises multiple layers of cutting edge technology. Security features of the new coin include:

- **A bi-metallic construction, of two colours.**
- **12-sided design.**
- **Complex design including a latent image feature, fine engraving, edge lettering and milled edges.**
- **The inclusion of The Royal Mint's new ISIS technology.**

ISIS, Integrated Secure Identification Systems, enables not just coins, but the whole cash cycle to be more secure, protecting the public, vending machine operators, retailers, and the wider banking system. It will allow the United Kingdom to rapidly reduce the rate of counterfeit coins entering general circulation (see overleaf for further information).

A full consultation will be held involving the public and key industry stakeholders over the next few months that will focus on how to manage any impacts, before a final decision is made on the precise specification of the new coin, including the metal composition.

A public design competition will be held at a later date to choose the design for the reverse, or 'tails', of the coin which is expected to be introduced in 2017. The proposed £1 coin design is distinctly British, with a twelve-sided shape which evokes memories of the pre-decimalisation threepence piece.

George Osborne, the Chancellor of the Exchequer, said, "After thirty years loyal service, the time is right to retire the current £1 coin, and replace it with the most secure coin in the world. With advances in technology making high value coins like the £1 ever more vulnerable to counterfeiters, it's vital that we keep several pieces ahead of the criminals to maintain the integrity of our currency. I am particularly pleased that the coin will take a giant leap into the future, using cutting edge British technology while at the same time, paying tribute to the past in the 12-sided design of the iconic threepenny bit."

The Royal Mint's Project ISIS received the 2013 Innovation Award from The Wales Quality Centre earlier this year, and was a finalist in the IACA Coin Innovation awards last year.

ISIS confirms our place as leaders within our industry

"We are thrilled to have the opportunity to support Her Majesty's Treasury and work on such an exciting project, which could potentially change the way that coins are made in the future. The current £1 coin design is now more than thirty years old and it has become increasingly vulnerable to counterfeiting over time. It is our aim to identify and produce a pioneering new coin which helps to reduce the opportunities for counterfeiting, helping to boost public confidence in the UK's circulating coins.

"It is vital that when introducing any new coin, the stakeholders in the industry work together to ensure the introduction causes minimal impact. The Royal Mint works closely with HM Treasury, the National Crime Agency and the cash-handling industry who are committed to maintaining the integrity of the UK's currency and exploring ways in which counterfeiting can be combated. Together we make sure that every effort is made to maximise opportunities to identify and withdraw counterfeit coins from circulation.

"We are very proud to be recognised nationally in terms of providing innovative solutions on an international scale. We are already known as the world's leading export mint, but ISIS confirms our place as leaders within our industry, as we continue to expand the boundaries of minting technology".

Adam Lawrence

Chief Executive and Deputy Master, The Royal Mint

Pictured outside 10 Downing Street, the Office of the British Prime Minister, are the delegates from the 2013 Coin Management Training Programme, organized by The Royal Mint.

The Royal Mint – a unique offering

The Royal Mint operates from a fully integrated, purpose-built site in the UK. Offering the ultimate range of choice including design, materials, construction, and security features, The Royal Mint works closely with all customers to ensure that the right coins are produced to match an issuing authority's needs.

The past 12 months have further cemented The Royal Mint's position as the world's leading export Mint, with deliveries to customers totalling circa 4 billion coins and coinage blanks covering around 100 different denominations. Our global presence has increased further with new international customers ordering our nickmore® plated steel coins and coinage blanks.

The Royal Mint has also undertaken a large-scale independent Circulating Coin Market Research study. This study was carried out to capture and understand the needs and values of the Customers, coupled with defining the relative and individual importance of the requirements. The respondents have provided The Royal Mint with significant insight and will enable us to provide more focused products and services to all customers. Many thanks to the 54 countries who gave up their time to complete the survey, The Royal Mint will send a detailed report of the survey to all respondents in the near future; we will also be sending a synopsis to the wider customer base for information and follow-up.

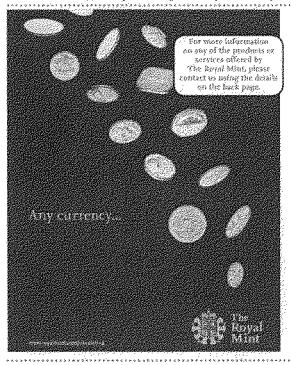
June 2014 will see The Royal Mint hosting its renowned Coin Management Training Programme. Now in its fourth year, this unique programme for Senior Central Bank delegates and Heads of State Mints focuses solely on Coin Management at all aspects of the Cash Cycle.

In addition to supplying circulating coins and coinage blanks to issuing authorities, central banks and mints around the world, The Royal Mint provides proven expert advice on the following:

- **Specification, design and production of coin currency.**
- **Cash cycle strategy and consultancy.**
- **Cash management, handling, and sorting.**
- **Counterfeit detection.**
- **Mint build and refurbishment consultancy.**
- **Tool design and manufacture.**

The Royal Mint has experience establishing alloy recovery programmes for end-of-life coinage, with reclaimed metal sold on to provide a new revenue stream. Not only will an issuing authority see increased seigniorage with nickmore full plate coins and coinage blanks, but the revenue from reclaimed end-of-life coinage can be utilized elsewhere.

There are many ways in which The Royal Mint can help all central banks, mints and issuing authorities. For more information on how you can benefit, contact The Royal Mint's dedicated Circulating Coin team using the details on the back page.



The Royal Mint wins 'Wales Innovation Award 2013'

In January 2014, The Royal Mint was awarded The Wales Quality Centre's prestigious Innovation Award 2013 for the revolutionary new high security coinage currency system, iSIS.

David Phillips, Chief Executive of the Wales Quality Centre and Chair of the judging panel said "It was the enormity of the likely global impact of the iSIS technology that won the day for The Royal Mint".

Over 50 original submissions were put forward for the Innovation Award, from a diverse range of industries, but The Royal Mint's entry was judged outstanding by the panel of judges and the potential impact was recognised as worthy of the top prize. At over 1,000 years old, The Royal Mint is Britain's oldest manufacturer, but this award demonstrates that the organisation is forward facing and embracing the future.

iSIS™
Integrated Secure Identification System

Protecting currency and integrity

"The development of our iSIS project has enabled us to develop a new generation of low cost, high security, plated coin with multiple levels of banknote-strength security built in.

At The Royal Mint, we are incredibly excited about the opportunities that iSIS brings, for us, our customers and the cash industry as a whole. For the first time, a solution is available to stop counterfeit coins from entering the cash cycle, and we are in discussion with several issuance authorities to look at how iSIS can help them protect the integrity of their currency."

Andrew Mills, The Royal Mint's Director of Circulating Coin

iSIS from The Royal Mint - a new generation of coin that offers higher security at lower cost

Launched in spectacular style at the Currency Conference in Athens last year, iSIS is a revolutionary innovation that increases security across the whole cash cycle. This award-winning new generation of coin incorporates banknote-strength security and can be authenticated in vending machines and cash centres.

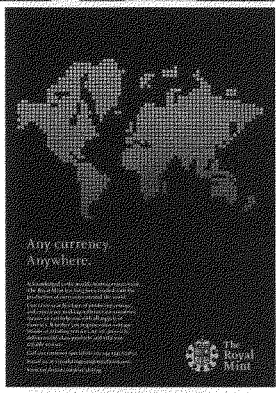
The work of The Royal Mint's in-house technology team, iSIS, Integrated Secure Identification System, involves the application of an existing security technology that has been proven over decades in banknotes. This is the first time that this existing security has been successfully embedded into coins.

Offering issuance authorities a viable alternative to high-cost homogeneous and clad coins, iSIS allows enhanced security at a lower cost. It will also compete with equivalent value banknotes as it can reduce whole life costs without compromising security. iSIS is not a surface coating, so will not wear off over time.

iSIS can be authenticated via high-speed automated detection, with tests showing detection much faster than the industry standard of 4,000 coins per minute. It is harder to counterfeit and yet easier to detect in vending machines than any coin before it.

iSIS utilises The Royal Mint's trusted nickmore® full-plate technology, which has benefits including covert and overt security features, increased seigniorage, significant cost savings compared to other coin products and banknotes, and exceptional proven wear-resistance.

The commitment of the UK Government to incorporate iSIS into the new UK £1 coin demonstrates the opportunity that iSIS represents for every issuing authority. This in turn will protect the public, vending machine operators, retailers, and cash centres in the wider banking system. iSIS detection will reject all counterfeit coins so the issuing authority, the cash handling industry and general public can have confidence in the currency.



Chancellor visits The Royal Mint to see new pound technology for himself

Less than a week after the announcement of a new UK £1 coin, the Chancellor of the Exchequer, George Osborne, visited The Royal Mint's headquarters in South Wales to see how innovative British technology will help make the new pound coin the most secure in the world.

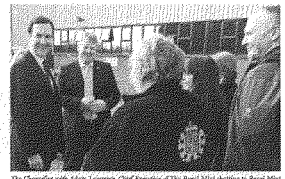
The Chancellor, who also carries the title Master of The Mint, said:

"I am here today to see where the new pound coin will be manufactured and to meet the team behind the cutting edge technology that will make the new coin the most secure in the world".

"The new coin exemplifies the best of British innovative manufacturing and will help secure The Royal Mint's status as the world's premier export Mint for years to come."

The Chancellor with Phil Carpenter, Director of Operations

The Chancellor with Matt James, Technical Development Manager



The Chancellor with Adam Lawrence, Chief Executive of The Royal Mint chatting to Royal Mint employees

The
Royal
Mint
ELIZABETH II D·G·REG·F·D·
2014
iSIS™
Integrated Secure
Identification Systems

The UK Government has announced that it will introduce a new £1 coin, which will be the most secure coin in circulation in the world.

The new UK £1 will be a pioneering new coin which helps to dramatically reduce the opportunities for counterfeiting, helping to boost public confidence in the UK's circulating coins.

The current £1 coin has been in circulation for over thirty years, with many coins from the introductory year still circulating today.

The Royal Mint has produced a prototype for a replacement £1 coin that utilises multiple layers of cutting edge technology. Security features of the new coin include:

- A bi-metallic construction, of two colours.
- 12-sided design.
- Complex design including a latent image feature, fine engraving, edge lettering and milled edges.
- The inclusion of The Royal Mint's new iSIS technology.

iSIS™

Integrated Secure
Identification Systems

iSIS, Integrated Secure Identification Systems, is new award-winning technology developed by The Royal Mint. It incorporates three tiers of banknote-strength security and can be authenticated via high-speed automated detection at all points within the cash cycle.

Her Majesty's Treasury and The Royal Mint will work with industry stakeholders and partners to ensure that the introduction of the new coin is effectively managed with minimal disruption and cost to all parties.

iSIS utilises The Royal Mint's trusted aRMour® full-plate technology, which has benefits including covert and overt security features, increased seigniorage, significant cost savings compared to other coin products and banknotes, and exceptional proven wear-resistance.

"We are particularly pleased that the coin will take a giant leap into the future, using cutting edge British technology."
Her Majesty's Treasury, UK

"The prerequisite of sound money is a sound currency... Now among the oldest of coins in circulation; one in thirty pound coins are counterfeit – and that costs businesses and the taxpayer millions each year. So I can announce that we will move to a new, highly secure, £1 coin. It will take three years. We will consult with industry. Our new pound coin will blend the security features of the future with inspiration from our past."
Chancellor of the Exchequer's Budget Speech 2012

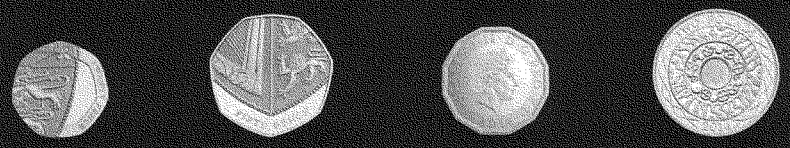
"The Bank welcomes today's news from the Treasury as another step forward in our collective efforts to maintain public confidence in the currency. Coins are the responsibility of The Royal Mint and together with the Bank's decision to produce polymer banknotes, this change will enhance the security and integrity of the currency."
Bank of England

"The NCA monitors trends in counterfeit coin production to identify and pursue those involved. The issuing of a new coin with enhanced security features will make it more difficult for criminals to copy as well as presenting increased opportunities for law enforcement to investigate and disrupt the producers and distributors of counterfeit currency."
National Crime Agency, UK

"Cash plays a pivotal role within our society and changes will ensure it continues to inspire trust in the years to come. We look forward to working together with The Royal Mint and other stakeholders to play our part and to make any changes as seamless as possible."
Cash Services, UK

"The AVA supports the development of a new coin which is more secure than its predecessor and can incorporate new technologies in the future and works through the existing machine base at minimal cost."
Automatic Vending Association

"Parking Operators have long expressed concerns about a rise in counterfeit £1 coins and the inconvenience this causes to motorists when coins are rejected by parking payment machines and the losses incurred as a result. We look forward to working closely with The Royal Mint during the public consultation on the introduction of this new coin with its improved security features."
British Parking Association



The new £1 coin will be part of the UK's eight-coin series, consisting of coins that have a range of metal compositions, shapes and security features. All made and distributed by The Royal Mint, the other UK coin denominations comprise aRMour® copper- and nickel-plated steel, shaped homogeneous alloys and the bi-metallic two colour £2 coin. Coins not shown to actual size.

The Royal Mint is the world's leading export mint, and operates from a fully integrated, purpose-built site in the UK. Offering the ultimate range of choice including design, materials, construction, and security features, The Royal Mint works closely with all customers to ensure that the right coins are produced to match an issuing authority's needs.

In addition to supplying circulating coins and coinage blanks to issuing authorities, central banks and mints around the world, The Royal Mint provides proven expert advice on the following:

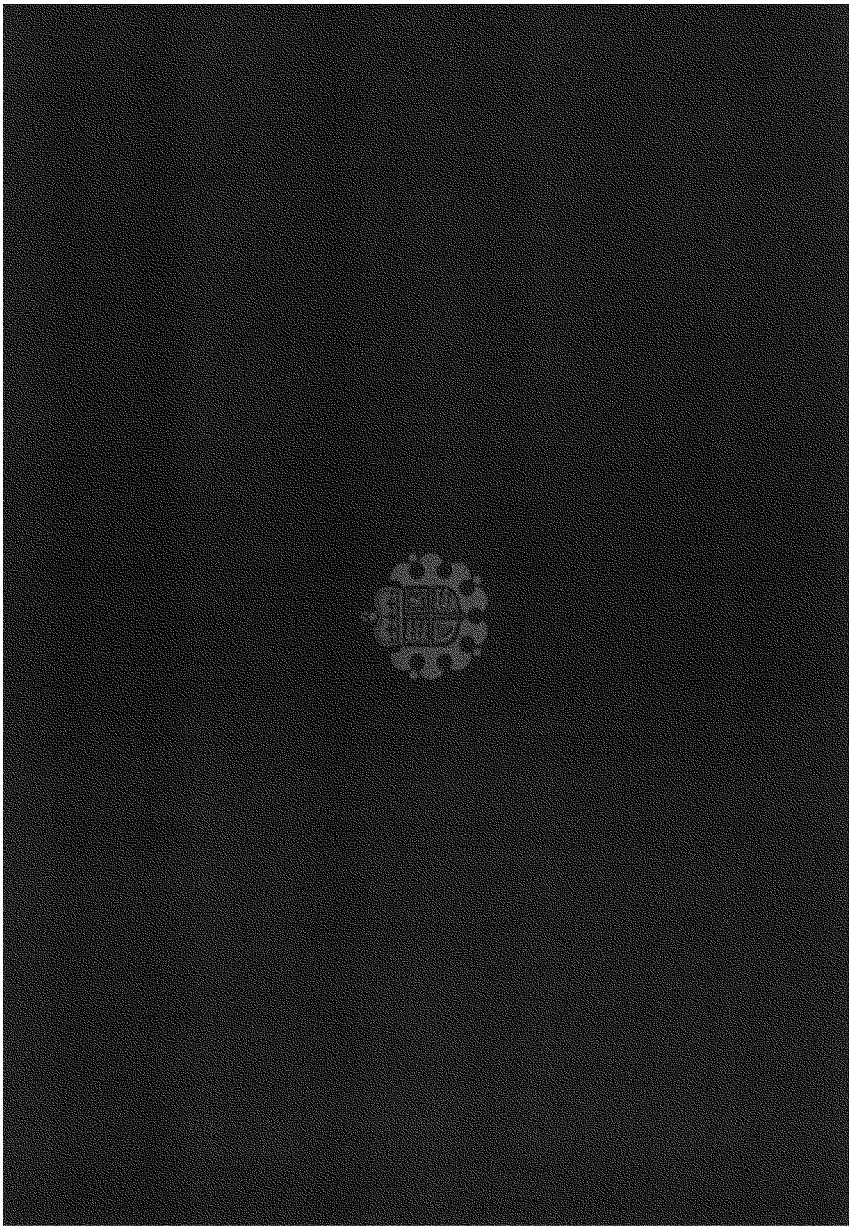
- Specification, design and production of coin currency.
- Cash cycle strategy and consultancy.
- Cash management, handling, and sorting.
- Counterfeit detection.
- Mint build and refurbishment consultancy.
- Tool design and manufacture.

The Royal Mint has experience establishing alloy recovery programmes for end-of-life coinage, with reclaimed metal sold on to provide a new revenue stream. Not only will an issuing authority see increased seigniorage with aRMour full-plate coins and coinage blanks, but the revenue from reclaimed end-of-life coinage can be utilised elsewhere.

There are many ways in which The Royal Mint can help all central banks, mints and issuing authorities. For more information on how you can benefit, contact The Royal Mint's dedicated Circulating Coin team using the details below:

The Royal Mint, Llantrisant, Pontyclun, CF72 8YT, UK
www.royalmint.com/circulating
E: circulatingcoin@royalmint.com
T: +44 (0) 1443 623852 F: +44 (0) 1443 623630
© The Royal Mint Limited 2014

The contents of this document must not be reproduced without prior permission of The Royal Mint.



iSIS™

Integrated Secure
Identification Systems

© The Royal Mint Limited 2013. All rights reserved

What is iSIS?

iSIS is a new currency system based around coins, with three tiers of banknote-strength security built in.

- It can be authenticated via high-speed automated detection (rapid machine readability) to the highest speeds capable of today's detection units in cash centres and central banks ,and is harder to counterfeit and easier to detect than any coin before it. *The only way to secure the whole cash cycle.*
- The three levels of security offered by iSIS – overt, covert and forensic (the first time in a coin) – enable Central Banks and Issuance Authorities to develop their cash management system as appropriate, and The Royal Mint offers unique and bespoke solutions to maximise the availability of currency.
- iSIS utilises aRMour® full-plate technology – more cost-effective than clad and homogeneous coins, currently in circulation in over 50 countries.

© The Royal Mint Limited 2013. All rights reserved

iSIS™

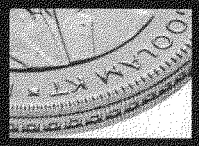
What is different about iSIS?

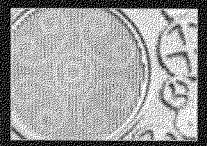
- Overt and covert security has been available in coinage for some time.
  - Existing covert security is limited; iSIS lifts covert security to banknote level.
  - Never before has forensic security been successfully incorporated into coins.
- It is not a surface coating so will not wear off over time.
- The technology used in the development of iSIS is proven but we have engineered it for this unique application that cannot be reverse engineered. The material has been specially developed for our Minting process, and we have worked with key approved partners to develop the unique, detectable properties of iSIS.
- A whole new level of detection in cash centre and vending machines is also possible, based upon other separate properties of the material, creating a solid barrier to entry for counterfeits which eliminates this channel of entry.

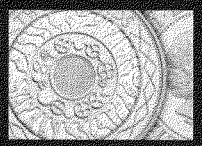
© The Royal Mint Limited 2013. All rights reserved

Currency Security Features

Security Level	Coin Features	Note Features
Level I – Overt	Micro text Edge lettering Latent feature Bimetallic	Watermark / windows Foil / motion thread Hologram Colour shifting ink
Level II – Covert	Electro Magnetic Signature (EMS) **iSIS**	Magnetic / IR inks UV features Moiré images
Level III/IV – Covert/ Forensic	**iSIS**	Optical Features, Forensic Markers







© The Royal Mint Limited 2013. All rights reserved

iSIS™

iSIS Comparison to EMS

		EMS		iSIS
High accuracy	—	Medium	✓	High
High speed	✓	4000 cpm	✓	4000 cpm
Long life	—	Changes with wear	✓	Constant signal
Low cost sensors	✓	Yes	✓	Yes
Suitable for vending	✓	Low cost Small size	✓	Low cost Small size
Suitable for sorting	—	Medium accuracy	✓	High accuracy

© The Royal Mint Limited 2013. All rights reserved

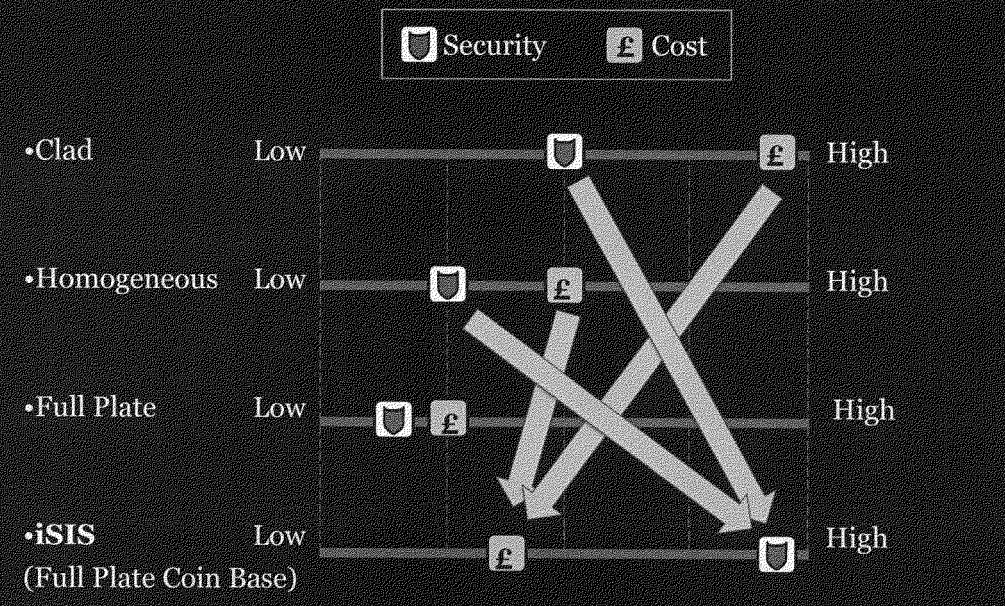
iSIS - the coin

iSIS is a currency system incorporating a new generation of coin with three tiers of bank-note strength security built in (overt, covert, and forensic) and offers rapid machine authentication.

- The product will replace high value homogeneous and clad coins:
  - The benefits are lower cost coupled with enhanced security.
- iSIS competes above the current coin/banknote boundary, targeting low value banknotes:
  - Reduced whole life costs without compromising security (our coins will last around 25-30 years whereas a low value banknote lasts less than a year, on average).

© The Royal Mint Limited 2013. All rights reserved

iSIS Comparison to other coin types



© The Royal Mint Limited 2013. All rights reserved

iSIS™

iSIS – the currency system

- iSIS offers a full end-to-end currency system, from specification, through coin production, to cash cycling, detection and validation.
- Utilising the unique and separate features of the material, detection and validation can take place at every part of the cash cycle, from issuing authority/central bank right through to cashiers with desktop or hand-held detectors/all vending options.
- The Royal Mint has technical specialists who can help Central Banks and Issuance Authorities to implement improvements across the cash cycle. Our experts will review each cycle individually creating unique and bespoke solutions.
- Our close links with the vending industry and coin sorter/ authentication manufacturers enables us to offer expert advice on how to optimise the management of the cash cycle.

© The Royal Mint Limited 2013. All rights reserved

Summary

- Greater security at lower cost
  - Increased Seigniorage
  - Affordability over clad and homogeneous coins
  - Reduced whole life costs compared to clad and homogeneous coins and equivalent value banknotes
- Currency credibility
  - Backed by robust and proven validation and detection systems
  - Three levels of security (overt, covert, forensic)
  - Credibility: The Royal Mint's proven quality and supply, coupled with unrivalled expertise in currency system specifications and design
- Choice and flexibility
  - Ultimate range of material and security features without compromise
  - Modular and flexible applications to the validation and detection elements of the cash cycle through technology advanced high-speed readers – "The Currency System"

© The Royal Mint Limited 2013. All rights reserved

iSIS™

Integrated Secure
Identification Systems

© The Royal Mint Limited 2013. All rights reserved

Mintage Figures

United Kingdom decimal coins issued into general circulation up to 31 December 2012

Issues that have been subsequently withdrawn from circulation are coloured blue

This document will be updated annually

Year	Denomination and number of coins issued								
	£2	£1	50p	20p	10p	5p	2p	1p	½p
1968					336,143,250	98,868,250			
1969			188,400,000 Britannia		314,008,000	120,270,000			
1970			19,461,500 Britannia		133,571,000	225,948,525			
1971					63,205,000	81,783,475	1,454,856,250	1,521,666,250	1,394,188,250
1972									
1973			89,775,000 EEC		152,174,000			280,196,000	365,680,000
1974					92,741,000			330,892,000	365,448,000
1975					181,559,000	141,539,000	145,545,000	221,604,000	197,600,000
1976			43,746,500 Britannia		228,220,000		181,379,000	300,160,000	412,172,000
1977			49,536,000 Britannia		59,323,000	24,308,000	109,281,000	285,430,000	66,368,000

Year	Denomination and number of coins issued								
	£2	£1	50p	20p	10p	5p	2p	1p	½p
1978			72,005,500 Britannia			61,094,000	189,658,000	292,770,000	59,532,000
1979			58,680,000 Britannia		115,457,000	155,456,000	260,200,000	459,000,000	219,132,000
1980			89,086,000 Britannia		88,650,000	220,566,000	408,527,000	416,304,000	202,788,000
1981			74,002,000 Britannia		3,487,000		353,191,000	301,800,000	46,748,000
1982			51,312,000 Britannia	740,815,000				100,292,000	190,752,000
1983		443,053,510 Royal Arms	62,824,904 Britannia	158,463,000				243,002,000	7,600,000
1984		146,256,501 Thistle		65,350,965				154,759,625	
1985		228,430,749 Leek	682,103 Britannia	74,273,699			107,113,000	200,605,245	
1986		10,409,501 Flax Plant					168,967,500	369,989,130	

Year	Denomination and number of coins issued								
	£2	£1	50p	20p	10p	5p	2p	1p	½p
1987		39,298,502 Oak Tree		137,450,000		48,220,000	218,100,750	499,946,000	
1988		7,118,825 Shield		38,038,344		120,744,610	419,889,000	793,492,000	
1989		70,580,501 Thistle		132,013,890		101,406,000	359,226,000	658,142,000	
1990		97,269,302 Leek		88,097,500		1,634,976,005	204,499,700	529,047,500	
1991		38,443,575 Flax Plant		35,901,250		724,979,000	86,625,250	206,457,600	
1992		36,320,487 Oak Tree	109,000 Single Market	31,205,000	1,413,455,170	453,173,500	102,247,000	253,867,000	
1993		114,744,500 Royal Arms		123,123,750			235,674,000	602,590,000	
1994		29,752,525 Lion Rampant	6,705,520 D-Day	67,131,250		93,602,000	531,628,000	843,834,000	
1995		34,503,501 Dragon		102,005,000	43,259,000	183,384,000	124,482,000	303,314,000	

Year	Denomination and number of coins issued								
	£2	£1	50p	20p	10p	5p	2p	1p	½p
1996		89,886,000 Celtic Cross		83,163,750	118,738,000	302,902,000	296,278,000	723,840,060	
1997	13,734,625 Technology	57,117,450 Three Lions	456,364,100 Britannia	89,518,750	99,196,000	236,596,000	496,116,000	396,874,000	
1998	91,110,375 Technology		64,306,500 Britannia 5,001,000 NHS 5,043,000 EU	76,965,000		217,376,000	98,676,000 Bronze 115,154,000 Copper-plated steel	739,770,000	
1999	33,719,000 Technology 4,933,000 Rugby World Cup		24,905,000 Britannia	73,478,750		195,490,000	353,816,000	891,392,000	
2000	25,770,000 Technology	109,496,500 Dragon	27,915,500 Britannia 11,263,000 Public Libraries Act	136,428,750	134,733,000	388,512,000	536,659,000	1,060,420,000	
2001	34,984,750 Technology 4,558,000 Marconi	63,968,065 Celtic Cross	84,998,500 Britannia	148,122,500	129,281,000	337,930,000	551,880,000	928,698,000	

Year	Denomination and number of coins issued								
	£2	£1	50p	20p	10p	5p	2p	1p	½p
2002	13,024,750 Technology 771,750 CW Games Scotland 588,500 CW Games Wales 485,500 CW Games Ireland 650,500 CW Games England	77,818,000 Three Lions	23,907,500 Britannia	93,360,000	80,934,000	219,258,000	168,556,000	601,446,000	
2003	17,531,250 Technology 4,299,000 DNA	61,596,500 Royal Arms	23,583,000 Britannia 3,124,030 Suffragettes	153,383,750	88,118,000	333,230,000	260,225,000	539,436,000	
2004	11,981,500 Technology 5,004,500 Trevithick	39,162,000 Forth Railway Bridge	35,315,500 Britannia 9,032,500 Roger Bannister	120,212,500	99,602,000	271,810,000	356,396,000	739,764,000	
2005	3,837,250 Technology 10,191,000 World War II 5,140,500 Gunpowder Plot	99,429,500 Menai Bridge	25,363,500 Britannia 17,649,000 Dictionary	124,488,750	69,604,000	236,212,000	280,396,000	536,318,000	

Year	Denomination and number of coins issued								
	£2	£1	50p	20p	10p	5p	2p	1p	½p
2006	16,715,000 Technology 7,928,250 Brunel: portrait 7,452,250 Brunel: achievements	38,938,000 Egyptian Arch Bridge	24,567,000 Britannia 12,087,000 VC: award 10,000,500 VC: heroic acts	114,800,000	118,803,000	317,697,000	170,637,000	524,605,000	
2007	10,270,000 Technology 7,545,000 Act of Union 8,445,000 Slave Trade	26,180,160 Millennium Bridge	11,200,000 Britannia 7,710,750 Scouting	117,075,000	72,720,000	246,720,000	254,500,000	548,002,000	
2008	30,107,000 Technology 910,000 1908 Olympic Games 918,000 Olympic Handover	3,910,000 Royal Arms 43,827,300 Shield	3,500,000 Britannia 22,747,000 Shield detail	11,900,000 Rose 115,022,000 Shield detail	9,720,000 Lion 71,447,000 Shield detail	92,880,000 Thistle 165,172,000 Shield detail	10,600,000 Feathers 241,679,000 Shield detail	180,600,000 Portcullis 507,952,000 Shield detail	
2009	8,775,000 Technology 3,903,000 Darwin 3,253,000 Burns	27,625,600 Shield	210,000 Kew Gardens	121,625,300	84,360,000	132,960,300	150,500,500	556,412,800	

Year	Denomination and number of coins issued								
	£2	£1	50p	20p	10p	5p	2p	1p	½p
2010	6,890,000 Technology 6,175,000 Florence Nightingale	57,120,000 Shield 6,205,000 Belfast 2,635,000 London	7,410,090 Girl Guiding	112,875,500	96,600,500	396,245,500	99,600,000	609,603,000	
2011	24,375,030 Technology 975,000 King James Bible 1,040,000 Mary Rose	25,415,000 Shield 1,615,000 Cardiff 935,000 Edinburgh	3,400,000 WWF	191,625,000	59,603,850	50,400,000	114,300,000	431,004,000	
2012	3,900,000 Technology 65,000 Olympic Handover	35,700,030 Shield	32,300,030 Shield detail	69,650,030	11,600,030	339,802,350	67,800,000	227,201,000	

50p Sporting Series; 2011

Aquatics	1,010,000	Hockey	1,001,000
Archery	1,010,000	Judo	1,005,000
Athletics	1,010,000	Modern Pentathlon	705,000
Badminton	1,005,000	Rowing	1,005,300
Basketball	1,748,000	Sailing	1,005,000
Boccia	1,005,000	Shooting	1,005,000
Boxing	805,000	Table tennis	1,010,000
Canoeing	1,010,000	Taekwondo	1,664,000
Cycling	800,000	Tennis	605,000
Equestrian	1,005,000	Triathlon	1,011,000
Fencing	1,005,000	Volleyball	1,005,000
Football	500,000	Weightlifting	1,105,000
Goalball	1,005,000	Wheelchair Rugby	505,000
Gymnastics	1,007,313	Wrestling	505,000
Handball	1,005,000		

The Royal Mint

Extracts from the Alternative Metals Study

Competitive benchmarking of The Royal Mint

Introduction

In 2012 the United States Mint commissioned Concurrent Technologies Corporation[1] (CTC) to conduct an unbiased, independent assessment of potential and currently available metallic materials and processing methods for production of circulating coins.

The objectives of the study were to provide information to assist with:

- Reducing the cost of producing circulating coins.
- Minimising conversion costs that would be necessary to accommodate significant changes to all circulating coins simultaneously.[2]
- Investigating and evaluating critical performance attributes including physical, electromagnetic, mechanical and chemical properties.

The Royal Mint was a key subject of the research study, having been selected by CTC as a result of its familiarity with US circulating coin specifications, its proven ability to develop and evaluate the use of alternative metallic materials and its experience of the potential impact of any revisions to the composition of the materials used in coin production.

The following are extracts (in italics) and summaries from the report which depict The Royal Mint's market position regarding current and emerging technologies, highlighting areas where it exhibits leadership, innovation or significant involvement in cross-industry development.

[1] Concurrent Technologies Corporation is an independent non-profit, applied scientific research and development organisation that carries out impartial, in-depth assessments and delivers reliable, unbiased solutions that emphasise increased quality, enhanced effectiveness, and rapid technology transition and deployment.

[2] Including the associated conversion costs of the wider cash validation and vending industries.

Considerations in cost reduction

As of March 2012 the cost to the United States Mint of producing 1c and 5c coins was greater than face value (negative seigniorage), as a result of both the high price of nickel and copper in addition to fabrication costs and indirect costs. This pressure was a primary driver of the need to find lower-cost methods for coin production.

Projected vending machine upgrade costs are also a relevant consideration. Thickness and diameter are the two most critical factors in vending machine verification. Any new coins that vary these characteristics over previous issues could potentially create expensive and time-consuming requirements for the modification of vending machines across the country.

"The Royal Mint took a different approach to the construction of their new [nickel-plated 5p and 10p] coins. The Royal Mint kept the weights and diameters of the new coins the same as the corresponding incumbent coins. This necessitated an increase in the thickness of the new coins, since the new materials of construction are of lower density than the incumbent cupronickel composition previously used for these coins."

"HM Treasury made an assessment prior to authorising The Royal Mint to develop and release new nickel-plated steel 5p and 10p circulating coins. HM Treasury determined that approximately 50% of the nation's one million machines impacted by the alternative material coin constructions would be vending machines."

Production technology

"A survey of mints around the world including The Royal Mint, the Royal Canadian Mint, the Royal Australian Mint, the Royal Netherlands Mint, the Austrian Mint, the Paris Mint and the German Mint revealed that no world mint is using an alternative production method..." to those currently used by the US (copper-plated zinc and clad homogenous material).

Production methods used by other world mints were evaluated to determine if alternative methods of producing coins would further reduce the costs to produce circulating coins.

"The Royal Mint uses an electroplating process called aRMour®. The technology is used to plate nickel on steel" A single nickel layer is plated onto the coins for more consistent sensor recognition in coin-processing equipment.

The nominal striking load for incumbent cupronickel 5c coins is 54 tonnes. Alternative compositions from different suppliers were tested against this loading.

"Carpenter Technology succeeded in developing a proprietary annealing procedure to lower the hardness [of stainless steel]. [However,] the nonsense pieces were not completely filled near the rim at a striking load of 70 tonnes, considerably above the nominal 54-tonne production load for incumbent cupronickel 5-cent coins. The maximum allowable load for the striking presses is 70 tonnes - a load that ensures the safety of both machinery and dies. The background surfaces showed some mottling even at a 70-tonne striking load."

"The Multi-Ply-plated steel planchets [from the Royal Canadian Mint] required a higher load (66 tonnes) for complete coin fill and dimensional tolerance than the nominal striking load (54 tonnes) for incumbent cupronickel planchets. At 60 tonnes, fill and dimensions were acceptable and the coins minted well with good surface detail. The additional 6 tonnes were required to ensure fill at the border of the coin adjacent to the rim."

"The aRMour® planchets were thicker than incumbent 5c planchet specifications for rim thickness. The thicker planchets showed good coin fill at 54 tonnes."

"Copper-plated steel planchets were obtained from The Royal Mint. At a striking load of 40 tonnes, the nominal striking load for the incumbent copper-plated zinc (CPZ), the nonsense pieces looked excellent and met the low end of dimensional specifications. However, the planchets were supplied in a thinner gage than normally used by the United States Mint. Thus the rim height of these CPS nonsense pieces would be expected to be lower than incumbent CPZ coins. The United States Mint press operator commented that the surface of these CPS nonsense pieces looked better than that of the incumbent CPZ one-cent coin."

Blank preparation

"Planchets supplied by The Royal Mint were not processed through the standard cleaning, burnishing and lubricating procedures [used by the study]. The Royal Mint says 'a small amount of the finishing solution may remain on the blanks, which can aid lubrication through the striking operation.' The Royal Mint specifically adds lubricants to the edges (only) of its planchets during the striking operation."

Die life

"Consistently high one-cent coin die failure rates significantly affect overall production costs. Average die life in 2009 reached a low of approximately 300,000 strikes...Since one press produces roughly 300,000 coins in an eight-hour shift, this failure rate reduced production efficiencies and [increased] costs from historical trends...at the Denver facility, the production rates rely on all presses to be operational at all times; therefore, an increase in the frequency of die changes can be disruptive...Denver facility engineers calculated that doubling the 1c coin die life would save $2,660/day for production rates equivalent to the monthly average at the Denver facility during 2011 i.e., 200 million one-cent coins per month."

"One area of potential future die research is the use of optimised physical vapor deposition (PVD) coatings for coining dies. Both The Royal Mint and the Royal Canadian Mint have developed such coatings; both of these mints contend that the coating improves die life in their operations[3]."

Coinage composition, alloys and concepts

"The coinage alloy suppliers were each asked to provide innovative coinage compositions and concepts that could lower costs. Several novel concepts were provided. The Royal Mint was consulted on material options and provided samples for testing. The Royal Mint offered to produce nickel-plated steel [aRMour®] coins for striking and testing."

"The Royal Mint is increasingly minting low-denomination, plated-steel coins for circulation in the UK and other parts of the world. The Royal Mint plates a single layer of relatively thick nickel (25 microns) on low-carbon steel and trademarked this technology under the name aRMour®."

"For lower denominations such as the one-penny coin, The Royal Mint plates copper on 0.008%C steel. The Royal Mint plates a thicker layer of copper (25 microns) on steel than the 8 microns of copper-plated on the zinc substrate used in the US 1c coin. The thicker layer of copper on the UK 1p coin is designed to reduce corrosion susceptibility."

[3] This extract from the report does not fully explain the relative involvement of the Royal Canadian Mint and The Royal Mint in this process. The Royal Canadian Mint has undertaken more development work than The Royal Mint although it remains a technology area under investigation by both organisations.

Fraud prevention and coin security

"Fraud protection and the security requirements of US circulating coins was one of the factors used to match alternative material candidates to coin denominations."

"Recent and ongoing research has been conducted throughout the world to develop additional security features for circulating coins. These efforts include:

- *Image recognition under various conditions; use of latent images that become visible at selected view angles; incorporation of radio frequency identification (RFID) tags;*
- *Three-material coins, including tricolor coins, bicolor coins with a clad center piece and five-layer clad coins.*
- *Laser etching of unique marks on individual coins that are later individually validated against a database of the associated information.*
- *Coin embedded taggants developed by the RM that glow under certain harmless wavelengths of infrared (IR) radiation."*

The report states that *"The United States Mint should continue to track technologies to improve coin security in the future and as they fit into United States Mint security strategies. The most promising of these technologies appear to be:*

1) use of three-material construction and
2) use of embedded taggants.

Innovative security technologies may prove useful in future construction of US circulating coins, the infrastructure to take advantage of these features is still many years from being developed to a level that such feature can be used to robustly validate circulating coins."

Material selection and properties

"After discussions with the Royal Mint it was decided that its extensive experience with plated-steel coinage would be useful to provide additional candidate materials in the present study; in addition, further assessments of plated-steel coins led to a more comprehensive understanding of the issues associated with a material that many are convinced is a low-cost option to incumbent materials used in US circulating coins."

"Low cost and minimal security needs [are part of] the rationale for recommending plated-steel coins. The low density of aluminum as an alternative material candidate did cause coin-acceptance equipment jamming problems, and was therefore strongly discouraged by all the manufacturers; all three coin-processing equipment manufacturers have experienced problems with aluminum coins used in their equipment within other countries."

Environmental issues

"An environmental assessment was made for each of the candidate materials. This assessment included the effects of air and water pollution, worker health hazards, toxicological effects and recycling. Local permitting issues at the United States Mint production sites were also considered in these environmental assessments. All alternative material candidates were found to have lower environmental impacts relative to incumbent coinage materials."

Conclusions

The Royal Mint continues to drive significant innovation in the development of steel-plated coins, as a result of its industry-leading aRMour® full-plate process.

The company has developed many improved processes for production, corrosion protection and sorting and vending machine recognition. Additionally, The Royal Mint has developed a unique technology transfer of covert and forensic security features to coins, which raises coin security to that of banknotes.

These developments prove that The Royal Mint is able to offer attractive alternatives to maximise cost-efficiency for circulating coins across the cash cycle. This makes The Royal Mint an ideal partner to any Central Bank or State Mint seeking to reduce costs, increase security, ensure longevity of circulating coins and analyse the potential costs associated with conversion.

This combination of technological leadership, coupled with an understanding of the broader issues around material properties and the impact of current and potential suppliers, means that The Royal Mint is well-equipped to play a major role in the future of coin production in the years ahead.

The Royal Mint, Llantrisant, Pontyclun, CF72 8YT, UK
Web: www.royalmint.com Email: circulatingcoin@royalmint.com
Tel: +44 (0) 1443 623852 Fax: +44 (0) 1443 623630
© The Royal Mint Limited 2013

Historical consultation documents

The Royal Mint

Royal Mint

PROPOSALS FOR A £1 COIN AND A 20p COIN

JANUARY 1981

Proposals for a £1 coin and a 20p coin

Changes in the coinage, including the introduction of new coins, are often controversial. The coinage, after all, is universally familiar and alterations inevitably arouse strong feelings. Market research commissioned by the Royal Mint shows, however, that individual views are often contradictory and can fail to take account of the many limitations which those responsible for the coinage have to consider.

This booklet explains why the Royal Mint has recommended the introduction of a 20p coin next year and a £1 coin, which will gradually replace notes, in 1983.

Requirements of a good coinage system

Although opinions on the subject can differ widely, a good coinage ought to satisfy the following requirements:

Individual coins should be easily distinguishable, both visually and by touch. (This is important in the dark and for blind or other handicapped people).

Coins should command respect. This is a somewhat nebulous concept but size, characteristics of the metal and design are all considerations here.

Subject to the foregoing coins should be small and light. Heavy coins 'burn' holes in the ordinary user's pocket, inconvenience those, such as milkmen, who carry around large quantities and add extra transport and security costs for bulk handlers like banks and supermarkets. There is no particular ideal size but the old silver 3d (0.64 ins./16.256 mm diameter)* and the present 5p (0.68 ins./17.145 mm) are coins which have often been criticised as too small.

A coinage system should be easily understood, in particular to help tourists and old people.

Coins have to be made so that counterfeiters cannot easily imitate them. Sophisticated alloys, intricate designs and elaborate edges may be needed.

A coinage system should permit the easy introduction of new coins.

Production and distribution costs should be kept to a minimum.

*Coin dimensions are normally quoted in metric terms but for the convenience of the reader an approximate imperial equivalent has been used.

Specifications for the new coins

The new 20p will fill the "slot" provided in the existing cupro nickel range by the Decimal Currency Board in 1971. It will be the same shape as the 50p and approximately 0.87 ins. (22 mm) in diameter.

The £1 coin presents a bigger problem. The present cupro nickel range does not have a suitable "slot" for a £1 coin. Anything bigger than the 50p, as already stated, would be too heavy so the answer seems to be something smaller in a different alloy. Yellow was the obvious choice.

At 0.87 ins. (22 mm) the coin will have the same diameter as the 20p and as the sovereign, and will occupy a "slot" between the 1p and 5p coins. The choice of a 22 mm diameter was determined largely on the grounds of weight and cost, and the need to allow for higher denomination coins in due course.

Two new coins of the same diameter might well be considered confusing but it is, in fact, entirely practicable as long as other features are different. In particular the £1 coin will be perceptibly thicker than others in the system. This will make it easy to identify in the dark, while appearance will meet the requirement that a prime unit of currency is elegant and prestigious. Other differences between the £1 and 20p will be colour, edge characteristics, weight, shape and topography of the reverse and obverse sides.

Annex

THE UNITED KINGDOM COINAGE

Denomination	Weight (grams)	Diameter (mm)	Thickness (mm)	Estimate No. in circulation as at 30.11.80
50p	13.500	30.00	2.29	535 M
10p	11.310	28.50	2.31	2048 M
5p	5.653	23.59	1.73	1922 M
2p	7.128	25.91	1.80	2273 M
1p	3.564	20.32	1.52	3291 M
½p	1.782	17.15	1.12	3482 M

CSP Printing at Cardiff

Royal Mint

THE UNITED KINGDOM COINAGE

ABOUT THIS PAMPHLET

This pamphlet has been produced by the Royal Mint. It describes some possible changes to the coinage. Although many people feel that our existing coinage is too heavy and that it may be sensible to replace some of our coins with lighter and smaller versions, it should be emphasised that no decision has yet been taken on which coins, if any, should be replaced. The possibilities are discussed in the following pages. The purpose of this pamphlet is to encourage all interested parties from industry and commerce, as well as from the general public, including the blind, to express their views. Comments on the proposals set out in this pamphlet should be sent to the Board Secretary, Royal Mint, Llantrisant, Pontyclun, Mid Glam. CF7 8YT.

The pamphlet incorporates some of the results of research by the Department of Psychology of the University of Nottingham into the ability of individuals to distinguish between different coins by sight and touch. The relevant sections of the pamphlet have been prepared after consultation with the authors of the research; they will be publishing their detailed results in the academic press.

July 1987

1. Changes in the coinage always arouse strong feelings. Coins are, after all, universally familiar and part of everyone's daily life. Such changes are, therefore, never taken lightly. But they are sometimes needed. One major reason for change has been the effects of inflation over the years: the structure of our present coinage was largely established at the time of decimalisation, before the rapid inflation of the 1970's. Other important reasons why changes are sometimes needed are long term movements in the price of metals, and developments in coin usage (particularly in coin-operated machines). And as new coins are added over the years, old ones have to be withdrawn to keep the number of different denominations at a manageable level, and to keep the overall weight down.

2. The objective of any individual change should be to produce a coinage system which is **convenient** to use, which is logical (i.e. which relates face value to size within each metallic range) and which is capable of further development.

A good system must have . . .

3. Although opinions on the subject can differ widely, a good coinage system should at least satisfy the following requirements:–

   - Individual coins should be **readily distinguishable,** both visually and by touch. (This is important in the dark and for blind or other handicapped people.)

   - Coins should **command respect.** This is an abstract concept but size, design and characteristics of the metal are all considerations here: excessively light alloys such as those made with aluminium, and coins with holes in the middle, are not popular.

   - At the same time, coins should be **not too large or too heavy.** Heavy coins tend to make holes in the ordinary user's pocket; they inconvenience those, such as milkmen, who carry around large quantities; and they add extra transport and security costs for bulk handlers like banks and supermarkets. Anything larger than the present 50p (30mm) is generally considered too big. But nor should coins be too small: the old silver 3d (approximately 16mm diameter) – not issued since the last war – and the ½p (around 17mm) which was withdrawn at the end of 1984 were often criticised on that score.

   - A coinage system should be **easily understood,** in particular to help those such as tourists, and the elderly.

   - Coins have to be made so that they cannot easily be **counterfeited.** Sophisticated alloys, intricate designs and elaborate edges may be needed.

   - Production and distribution **costs should be kept to a minimum.**

   - Coins should be **suitable for use in meters and vending machines.**

Constraints on change

4. There are now more than 14,000 million coins in circulation. It would not be practicable to design a completely new system, build up a stock of new coins and then rapidly replace all the old coins with new. The public would be confused, and the costs would be excessive. So any change must involve phasing particular coins in and out of circulation, while avoiding confusion between old and new coins.

5. Size "slots" for new coins have to be found. As a general rule there ought to be a minimum difference of 2mm in the diameter of otherwise similar coins in order to ensure that it is easy to distinguish between them. Coins of the same or similar diameter can co-exist provided they are different in other respects, particularly in thickness, colour and shape.

6. Additional coins tend to add to the weight of the overall system. When a new coin is added, another should ideally be dropped so that the coinage does not become too heavy.

7. To suit vending machines, coins must roll easily and be sufficiently heavy to make the machines work. This rules out many shapes — such as square or triangular — and many alloys — such as those of aluminium.

Decimalisation and after

8. Decimalisation in 1971 was a watershed in the history of the UK coinage, marking the beginning of a new system which to this day is not yet fully complete. The ½p, 1p, 2p and 50p were new at the time, but the sizes of the old pre-decimal one shilling and two shilling (florin) coins were retained for the new 5p and 10p denominations — and old shillings and florins continued in circulation. This was done to avoid the confusion which would have been caused by a completely new set of coins.

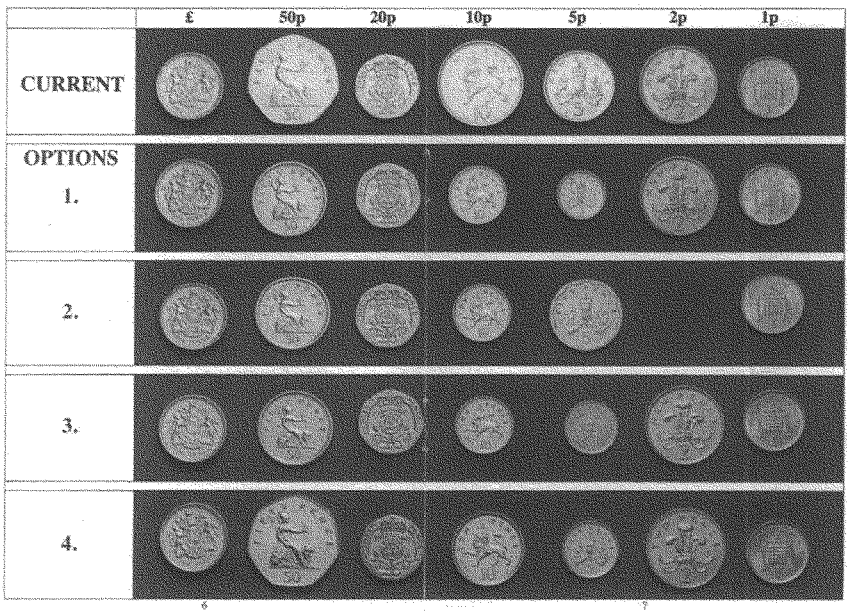
9. By the end of the 1970's the new coinage had become unsatisfactory in a number of ways. The existing range of coins appeared inadequate. There was strong evidence that a 20p or 25p coin was needed between the 10p and 50p. And, as a result of past inflation, a £1 coin was becoming increasingly necessary.

10. Furthermore, a survey in 1979 indicated that the coinage was widely regarded as being much too heavy. This was mainly due to the fact that, traditionally, coins of the same alloy had always been weight related. That is to say the 2p was twice as heavy as the 1p, and the 10p twice the weight of the 5p. The introduction of the 50p in 1969 had also added significantly to the average weight of a pocketful of coins.

The need for change

11. The 20p and £1 coins were accordingly introduced in 1982 and 1983 respectively. The small 20p was meant to serve two purposes. First, it bridged the gap between the 10p and 50p, and second, it substantially reduced the average weight of a handful of change by displacing two large, heavy 10p coins. In their size and shape both the 20p and £1 coins broke new ground, primarily because there was no size "slot" for the 20p between the 10p and 50p, and because a £1 coin larger than the existing 50p would have been too heavy.

12. However, surveys show that people still consider the coinage system unsly and, as a whole, too heavy. The 10p and 5p coins are the obvious targets for change. Both are weight related, which is costly and no longer necessary, and both appear out of series with the more recent 50p and 20p coins.



Background to recent research

13. History shows that the public in the United Kingdom usually dislikes the introduction of new coins. Neither the 20p nor the £1 was immediately popular, though the former became so fairly quickly. The 50p when introduced in 1969 caused such a furore that attempts were made in Parliament to have it withdrawn. Such attitudes change quite markedly over time, and it is very likely that if steps were now taken to change the 50p coin there would be similar public resistance. Nevertheless, public opinion at the time of a change is clearly important.

14. This is why, before any decision was taken to issue 20p and £1 coins, the Royal Mint commissioned the University of Nottingham to undertake a research programme to see how easy it was to distinguish between different sizes and shapes of coins. As a result of this research both the 20p and £1 coins were provided with features to make them easier for the blind to identify.

15. When the research was completed, the Royal Mint published a pamphlet in January 1981, "Proposals for a £1 Coin and a 20p Coin". This was used as a basis for consultations, before the Government took a decision on the precise specifications of the proposed coins.

16. After the new 20p and £1 coin had been issued, the University of Nottingham was invited to undertake a second phase of research into a series of options for further possible changes in the UK coinage.

The options

17. Four possible options were explored. These are illustrated on the centre pages. Options 1, 2 and 3 all featured a new 10p coin very similar to the old sixpence, with a choice of three specifications for a new 5p: in Option 1, a white coin somewhat smaller than the old sixpence; in Option 2, a bronze coin slightly smaller than the 2p (which would require the present 2p to be withdrawn from circulation); in Option 3, a yellow coin similar to the old multi-sided 3d but smaller. In Option 4, however, it was the 5p which was replaced by a coin similar to the old sixpence and the 10p by a coin slightly larger than the current 5p. Options 1, 2 and 3 provided for a new 50p, circular and a little smaller in size than the existing 2p, while option 4 left the 50p as it is.

18. The Royal Mint commissioned a survey of public opinion on these options. This was done by a London based market research company. Some 2400 adults throughout Great Britain were questioned.

Results of the survey

19. Although, predictably, only a minority of those questioned were in favour of change, when they were asked to choose between the four options for the 5p and 10p, Option 4 was clearly the most popular. 29% did not express a preference, but, of those who did, the choices were:

Option 1	7%
Option 2	26%
Option 3	23%
Option 4	44%

20. While it is more often suggested that our coinage, taken collectively, is too heavy, the survey revealed that people tend to prefer individual coins to be reasonably large. Thus, when initially asked whether it would be a good or bad idea to replace large, heavy coins with smaller, lighter ones, 59 per cent thought it a bad idea and only 29 per cent a good idea. More specifically, when asked if the 50p should be reduced in size, 69 per cent thought this a bad idea.

Discrimination Research

21. As before the introduction of the £1 and 20p coins, the Nottingham researchers looked into the ease with which the coins in each of the four options could be told apart. The technical term for this is discrimination.

22. Their studies used simple coin handling tasks undertaken in varying conditions by different groups of people. The handling tasks included sorting out mixtures of coins, and searching for specified target coins in purses or pockets. The speed of sorting or searching and the number of errors provided measures of relative difficulty, with the speed and error rate for handling the existing coinage system also being measured for comparison. In most of the work volunteers from the general public were tested. Two tests were conducted with elderly residents in sheltered accommodation and one with a sample of blind people who relied solely on touch when handling money. Blind people clearly have particular difficulty in identifying a coin in isolation.

23. The research indicated that replacing the 50p with a smaller circular coin, as in options 1, 2 and 3, would not improve discrimination and could introduce confusion between the new 50p and other coins. The research team also concluded that, if new 5p and 10p coins were to be introduced, it would be preferable to replace the 5p before the 10p.

24. The main conclusion of the discrimination study was that none of the four options for the 5p and 10p posed significant problems. Indeed, for a first stage involving the replacement of the 5p only, all the options were found to be more satisfactory than the present coinage. No significant problems of discrimination were evident even if both 5p and 10p were changed simultaneously.

Conclusion

25. The opinion survey shows that of the four options, number 4 is clearly the most attractive. It retains the 50p coin, yet considerably reduces the overall weight of the coinage. Tests showed that none of the options for the 5p and 10p would make it any harder to tell different coins apart.

26. The choice therefore appears to lie between retaining the existing range of coins and moving over to Option 4. The survey found that the proposed new 5p in Option 4 was very satisfactory. The only possible problem with this option was a potential confusion between the proposed 10p and the £1 coin, but a way round this has now been found by slightly modifying the specification for the 10p. If option 4 were chosen, the 5p would be replaced before the 10p.

27. Before any decision is taken, it will be necessary to establish whether the changes would lead to savings or increased costs in maintaining the coinage in good order; and what benefits or disadvantages there would be for bulk users of coins such as banks, the vending industry, transport undertakings, and people like milkmen who have to carry large quantities of coins. Comments from groups such as these, as well as from individuals, would therefore be welcome as part of the consultation process.

ROYAL MINT

THE UNITED KINGDOM COINAGE REVIEW
1994

INTRODUCTION

Earlier this year the Royal Mint was asked by the Chancellor of the Exchequer to conduct a review of the United Kingdom coinage. This review is now in progress and is intended to focus particular attention on whether the existing 50p piece should be replaced by a smaller coin and also on the possible introduction of a £2 coin for general circulation.

This pamphlet sets the scene for the public consultation exercise which is part of the review, and outlines the options for consideration.

In addition to seeking opinions from the general public the Royal Mint is also consulting major users and handlers of coins such as the vending industry, banks and retailers, as well as special interest groups representing for example blind people and the elderly.

Change is not a foregone conclusion. The purpose of the present review is to establish whether or not any changes are desirable. One option is to retain our existing range of coins.

October 1994

BACKGROUND

The Royal Mint is responsible for the continuous review of the United Kingdom coinage and for providing advice on coinage specifications. The designs are approved by Her Majesty the Queen, who is advised by the Royal Mint Advisory Committee under the Presidency of HRH the Duke of Edinburgh.

Although the coinage underwent a major overhaul at the time of decimalisation over twenty years ago, there have since been a number of important changes. These include the introduction of two new denominations, the 20p in 1982 and the £1 in 1983, and more recently the replacement of the old 5p and 10p coins. The general tendency has been to make the coinage smaller and lighter, yet despite the introduction of smaller 5p and 10p coins in 1990 and 1992 respectively, the current range of United Kingdom coins is still one of the heaviest in Western Europe.

Of the current coins, the 50p is the largest and heaviest. In 1991 the Treasury and Civil Service Committee of the House of Commons recommended that effective market research be carried out 'to establish whether a 50p coin is required within the present system of coins and if so whether it would be appropriate to introduce a new, lighter and smaller 50p to follow the changes currently planned'.

This recommendation was accepted by the Government and a major purpose of the present review is accordingly to consider the future of the 50p. At the same time, with the £1 coin now well established, it seems sensible to address the question of whether a need exists for a circulating £2 coin.

THE REQUIREMENTS OF A COINAGE SYSTEM

General principles

Any changes must take account of the following general principles:

- A coinage system should be easily understood.
- The coins themselves should command respect. This is an abstract concept but size, design and characteristics of the metal all have to be considered: excessively light alloys such as those made with aluminium, and coins with holes in the middle, are not popular in this country.
- Individual coins should be readily distinguishable, both visually and by touch. This is important in the dark and for blind or other handicapped people.
- Coins should neither be too large nor too heavy. Heavy coins tend to make holes in the ordinary user's pocket; they inconvenience those, such as market traders, who carry around large quantities; and they add extra transport and security costs for bulk handlers like banks and supermarkets. Anything larger than the present 50p (30.00mm in diameter) is generally considered too big. Nor should coins be too small: the old ½p (17. 145mm in diameter) withdrawn at the end of 1984 may indicate the limits here.
- Coins should be suitable for use in meters and vending machines.
- Coins have to be made so that they cannot easily be counterfeited and may therefore require sophisticated alloys, intricate designs and elaborate edges.
- Production and distribution costs should be kept to a minimum.

Constraints on change

- Frequent changes to the coinage are unwelcome. Any change involves cost and inconvenience and, therefore, must be fully justified and carefully planned, avoiding confusion between old and new coins.

- It is not easy to find size 'slots' for new coins. As a general rule there ought to be a minimum difference of 3mm in the diameter of otherwise similar coins in order to ensure that they can be readily distinguished. Care must also be taken to avoid coin 'slots' which are the same as those in other countries as this can lead to abuse in vending systems. Nevertheless, coins of the same or almost the same diameter can co-exist provided they are different in other respects, such as thickness, colour and shape.

- Additional coins tend to add to the weight of the overall system. When a new coin is added, another should ideally be dropped so that the coinage does not become too heavy.

- To suit vending machines, coins must roll easily and be sufficiently heavy to make the machines work. This rules out many shapes, such as squares or triangles, and also many light-weight alloys, such as those of aluminium.

THE PRESENT REVIEW

The coinage system at present has a four-tier structure, with each tier consisting of coins of the same alloy and shape and sometimes, though not always, in a weight/value relationship.

The four tiers are as follows:

Tier 1 - round 1p, 2p in bronze and, since 1992, copper-plated steel
Tier 2 - round 5p, 10p in cupro-nickel
Tier 3 - shaped 20p, 50p in cupro-nickel
Tier 4 - round £1 in nickel-brass

The specifications of United Kingdom coins are shown in Appendix I.

Even if the structure of tiers is disregarded, the range of options for a small 50p or a new £2 coin is constrained by the limited number of coin slots currently available.

50p coin

The 50p was introduced in 1969 as part of the change to decimal coinage and was at that time the highest-value coin in the currency system. Its size, seven-sided shape and weight were influenced by factors which are not relevant in their entirety today - such as the need to distinguish it from the old 10p or florin.

In considering options for a smaller 50p, however, various possibilities have had to be discarded. A nickel-brass (yellow) coin would be undesirable because, in order to distinguish it from the nickel-brass £1 coin, the new coin would have to be larger. This could negate any weight-saving compared with the present coin and might be confusing to users as a coin larger than the £1 but with a lower denomination. A bi-metal (two-coloured) coin has also been rejected for the 50p denomination, as it would usually be reserved for a coin of higher value in view of its technical sophistication and consequent cost.

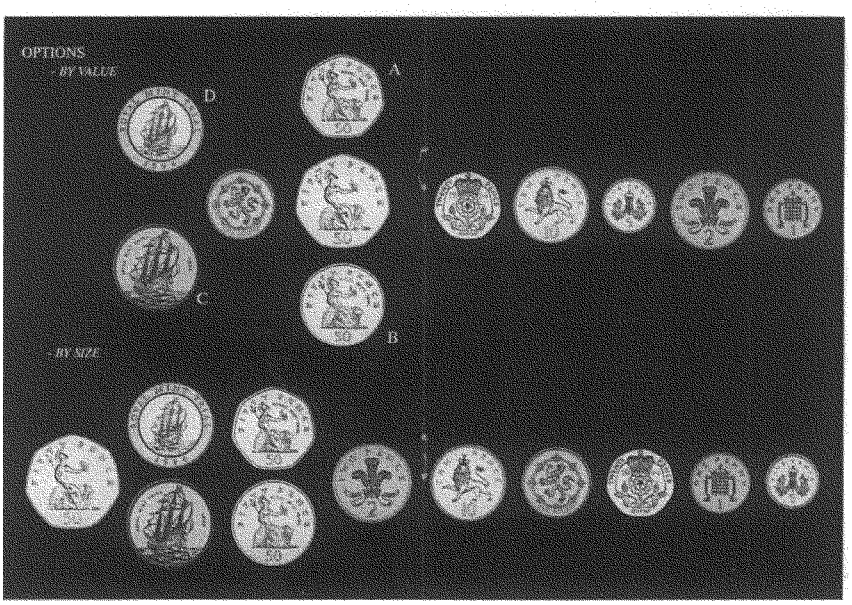
Accordingly, this leaves two main alternatives to the continuation of the present 50p:

- a smaller, seven-sided coin in cupro-nickel with an unmilled edge;

- a smaller round coin in cupro-nickel with a milled edge.

Both of these fit into our existing coinage range (being larger in diameter than the 20p coin) and offer considerable reduction in the overall weight of the coinage.

Retention of the 50p in its present form also remains an option.



£2 coin

The current review focuses, in the case of the £2 denomination, on two issues:

a. Would the introduction of a circulating £2 coin be justified?

b. If so, what form should it take?

The principal arguments so far advanced for and against a £2 circulating coin can be summarised as follows:-

The case for

i. The purchasing power of a £2 coin now would be considerably less than that of the 50p when it was introduced in 1969 and just over that of the £1 coin in 1983.

ii. The United Kingdom in common with most other countries has a currency broadly based on a series of denominations following the 1, 2, 5 pattern. £2 is at present the only missing denomination in this series and could be filled more economically by a coin than by a banknote because of the much longer life of coins.

iii. Assuming a £2 coin weighed less than twice the £1 coin, it would be likely to reduce the overall weight of coinage for users and also the cost to the Exchequer in the longer term.

The case against

i. An extra denomination would add to the complexity of the currency, especially for elderly and handicapped people.

ii. The extra slot which would be required in tills, vending machines etc could pose problems for some larger-scale commercial users of coinage.

iii. There would be an additional short-term cost to the Exchequer, as the initial expense of issuing £2 coins would not be immediately offset by equivalent savings in the cost of other coin or note issues.

Regarding the size, shape and colour of a £2 coin, the existing commemorative version most recently issued in 1994 to celebrate the tercentenary of the Bank of England is not considered a suitable coin for general circulation because of its weight (almost 16 grammes, or 20% heavier than the present 50p). Such a coin would defeat the objective of achieving coinage which is light and convenient to use.

The following options for a circulating £2 coin are, therefore, put forward:

- A round coin of the same diameter and the same metal (nickel-brass) as the existing commemorative coin but thinner and lighter. The coin would have a milled edge and an edge inscription like the £1 coin for extra security against counterfeiting.

- A round coin of the same size and thickness as the first option but in bi-metal form, consisting of an outer-ring in yellow metal (probably aluminium-bronze or nickel-brass) and an inner disc in white metal (cupro-nickel). Bi-metal coins are already used in a number of countries for high denomination coins. This option too would have an edge inscription, with an interrupted milled edge.

Number of denominations

The coinage review also covers the question of whether the United Kingdom has the right number of denominations, particularly in the light of the possible addition of a £2 coin.

Views are invited on whether we have the appropriate number of denominations (either now or in the event of a £2 coin being added). If a denomination is to be dropped, which one should it be? From the standpoint of reducing the weight and expense of the coinage, the most obvious possibilities for withdrawing a denomination would be the 2p or 50p coin. However, both these denominations are still in circulation in

large numbers and to eliminate either from the coinage range would break the 1, 2, 5 system mentioned above.

Research

The Royal Mint has commissioned the University of Stirling to research the options for both the 50p and £2 coins discussed above. This research is looking into the ease with which United Kingdom coins, including each of the options, can be recognised or discriminated from each other.

Their studies use simple coin handling tasks undertaken in varying conditions by different groups of volunteers to see if any of the options would cause difficulties for the general public. The handling tasks include sorting out mixtures of coins, and searching for specified target coins in purses or pockets. The speed of sorting or searching and the number of errors provide measures of relative difficulty, with the speed and error rate for handling the existing coinage system also being measured for comparison.

The results of this research will be available for consideration by Ministers at the conclusion of this consultation process.

In addition, the Royal Mint has commissioned a public opinion survey on the options in this pamphlet. These results will also be available prior to any conclusions being reached on the review.

SUMMARY OF OPTIONS

The options for a smaller 50p coin - seven-sided or round, both in cupro-nickel - and for a new £2 circulating coin (nickel-brass or bi-metal, both round and lighter than the present commemorative coin) are illustrated along with the existing coins on the centre pages of this pamphlet. The design shown on the £2 coins is not necessarily the design that would be used on a circulating version. This has been included for illustrative purposes only.

Features such as thickness and edge style are difficult to convey in a photograph but they are an important consideration and can be modified if required at a later stage in the development of the specification.

It must be emphasised that no decision has been taken to introduce new coins or to change any existing coins. The option remains of retaining the present system.

TIMESCALE

Consultation is expected to take around two months and analysis of the results will follow.

In the light of these results a recommendation will be made to the Chancellor of the Exchequer early in the new year though it is thought unlikely that the Chancellor will take a final decision before March or April 1995. Before any decision is taken a full review will be made of the overall cost, both to the Exchequer and to coin users, of any changes. The likely issue date of a coin with a new specification would be 1997, although in the case of a £2 coin a slightly earlier issue date would be possible.

If you would like to express your views on the possibilities which are included in this pamphlet all you need to do is complete the detachable reply card and return it by post to the Royal Mint - no stamp is required - to arrive no later than 30 December 1994. Members of the public might find it convenient to use this form in response. Organisations representing various groups might prefer to write separately.

****

APPENDIX I

SPECIFICATION OF UNITED KINGDOM COINS

Current coins

Denomination	Composition	Weight *(grammes)*	Diameter *(mm)*	Thickness *(mm)*	Estimated Number in Circulation at 31 December 1993 *(millions)*
£1	nickel-brass	9.50	22.5	3.15	974
50p	cupro-nickel	13.50	30.0	2.50	507
20p	cupro-nickel	5.00	21.4	1.70	1394
10p	cupro-nickel	6.50	24.5	1.85	1269
5p	cupro-nickel	3.25	18.0	1.70	2491
2p	copper-plated steel	7.12	25.9	2.03	3641*
1p	copper-plated steel	3.56	20.3	1.65	5973*

**Includes pre-1992 dated bronze coins as well as those more recently issued in copper-plated steel.*

Options for consideration

Denomination	Composition	Weight *(grammes)*	Diameter *(mm)*	Thickness *(mm)*
£2	nickel-brass	12.00	28.4	2.70
£2	bi-metal (nickel-brass / cupro-nickel)	11.00	28.4	2.45
50p (seven-sided)	cupro-nickel	8.50	27.5	1.90
50p (round)	cupro-nickel	8.50	27.5	1.94

Note: these specifications are provisional and will be finalised as part of the consultation process.

UNITED KINGDOM COINAGE REVIEW

Your name and address is requested solely for ratification in the present consultation. It will not be used for any other purpose.

No acknowledgement will be provided.

Please tick as appropriate

		YES	NO
1. i.	Should the 50p coin be changed?	☐	☐
ii.	If there is to be a change, which option is preferred? A = Shaped, B = Round	A ☐	B ☐
		YES	NO
2. i.	Should a £2 coin be introduced?	☐	☐
ii.	If so, which option is preferred? C = Yellow, D = Bi-colour	C ☐	D ☐
		YES	NO
3. i.	Should any existing denominations be dropped?	☐	☐
ii.	If yes, which?	☐	

OTHER COMMENTS: .....

Name: .....

Address: .....

November 2013

BRIEFING PAPER FOR UNITED STATES CONGRESSIONAL COMMITTEES AND STAKEHOLDER GROUPS

ABOUT GREAT BRITAIN'S ROYAL MINT

The Royal Mint is the world's leading export mint of coins and coinage blanks. The Royal Mint is based in Wales, Great Britain, at a purpose-built headquarters that was opened by HM Queen Elizabeth II in 1968.

The Royal Mint produces 90 million coins and blanks a week equating to c. five billion coins a year, at the peak of its productive capacity. It supplies the coinage requirements of c. sixty countries per year and plays a unique role in the globalised economy of the 21st century.

With an 1100-year history The Royal Mint has evolved to become a sophisticated industrial concern. It operates today as a trading company that is wholly owned by the British Government and returns a dividend to Her Majesty's (HM) Treasury.

At the time of writing, The Royal Mint continues to be active with the US Treasury regarding the future specification and supply of coinage blanks.

COINAGE MATTERS

Coins matter in macro-economic terms as a core component of a nation's money supply and in micro-economic terms as the primary means of exchange for goods and services.

As the world returns to growth following the financial crisis, the role of coins will be of fundamental importance. Their presence fuels economic activity and serves to underpin the probity and financial status of the issuing authority; whether this is a state Government, central bank or treasury department.

The Royal Mint is estimated to have 15% of the available global coin market which excludes self-sufficient countries (for example the US, India, China, Japan, South Africa, and South Korea).

COUNTERFEITING

The Royal Mint has a long history of developing anti-counterfeit elements for coinage. Sir Isaac Newton worked at The Royal Mint from 1696 until his death in 1727. Key elements of his legacy were to improve the standard of exactness of the coins of the realm to minimise the likelihood of counterfeiting, and his bringing to justice those who clipped and counterfeited the coins. Today, skilled craftsmen and advanced technology are used together to produce a wide range of overt security features, including latent images, edge lettering and grooves, fine detail and bi-colour options.

Overt security aids public recognition and confidence in a country's coins, but covert security is recognised as essential to the collaboration with the cash industry. In addition to size, shape and weight, Electro-magnetic signature is used by vending and coin-processing machines to identify genuine coins and reject counterfeits. aRMour® is The Royal Mint's plated coin offering, which has a single, relatively thick layer of metal electroplated onto a steel core. The layer is considerably thicker than that used in alternative plated steel products which enables a more consistent product, this being favoured by the vending industry, as evidenced in the European Vending Association Coin Design Handbook 2012, page 30:
"Although multilayer plated coins enable other single layer plated steel coins that have a similar diameter and thickness to be differentiated, they have a high risk from fraud because of their steel and copper/nickel plated construction. Overall they offer no improvements in security using inductive material sensors in today's coin validators, when compared to a single plated layer... As the thin outer layer [of multilayer plated coins] wears in use, the reduction in plating thickness can represent a relatively large percentage change compared to thicker layers."

In the UK, The Royal Mint works closely with commercial banks and the wider cash industry to ensure coin sorting equipment is correctly calibrated to remove counterfeits from circulation.

Public education material is provided to enable counterfeit identification and The Royal Mint regularly provides expert witnesses to assist UK law enforcement agencies with investigations and prosecutions. Bi-annual UK counterfeit surveys are conducted to monitor counterfeit rates, incorporating visual and material science counterfeit analysis to identify and categorise counterfeit 'families'. This provides critical intelligence for the National Crime Agency (formally the Serious Organised Crime Agency) to ascertain which counterfeiters' products are circulating and if there are new types of counterfeit in circulation. Private enterprise benefits from a secure cash cycle as no revenue is lost due to counterfeits.

The Royal Mint's proprietary technologies also ensure that coinage remains difficult to counterfeit and environmentally sustainable in comparison to banknotes and other coinage compositions. Announced at the Currency Conference in May, 2013, iSIS from The Royal Mint is a new security feature that secures the whole cash cycle and takes coin security to lengths previously unseen. Utilising technology proven in other applications, including banknotes, iSIS offers a new level of covert security coupled with forensic security. For the first time, a coin offers three tiers of banknote-strength security.

DELIVERING SAVINGS FOR TAXPAYERS

After three years of consultation with HM Treasury and industry stakeholders, including providing samples two years in advance, The Royal Mint introduced nickel-plated steel 5 and 10 pence coins to co-circulate with and eventually replace the existing cupronickel coins. The change in composition dramatically improved the positive seigniorage of the coins (cost is lower than face value), therefore avoiding the negative seigniorage scenario experienced by other issuance authorities. The replacement programme allows for The Royal Mint and HM Treasury to run an Alloy Recovery Programme to reclaim legacy metals for recycling and sale. In the financial year 2013-2014, the value of the legacy metal returned to HM Treasury will exceed £10 million.

ENVIRONMENTAL IMPACTS

In addition to the Alloy Recovery Programmes referenced above, it is important to note that Full-plate nickel-plated coins from The Royal Mint can be recycled into stainless steel whereas this is not possible with dual- or triple-plated nickel coins due to the copper layer having a negative impact on recycling options.

Coins from The Royal Mint last for more than 20 years, whereas low denomination banknotes last on average one year, so production frequency is much more in favour of coins. Our coins last longer than dual- and triple- plate coins due to the outer layer thickness, as referenced above.

EXPERT PARTNERS

In 2012, The Royal Mint provided product samples for the Concurrent Technologies Corporation report commissioned by the United States Mint to conduct an unbiased, independent assessment of potential and currently available metallic materials and processing methods for production of circulating coins. More recently, further samples have been provided for on-going studies. The Royal Mint works closely with the coin sorting and detection industry, and is involved in the Mint Directors Conference Technical Committee.

Andrew Mills, Director of Circulating Coin at The Royal Mint, has recently met with the following:

- Rosie Rios, 43 Treasurer of The United States Treasury

- Richard A. Peterson, Deputy Director at United States Mint
- Richard R. Robidoux, Division Chief, Engineering and New Technology at United States Mint
- Uvon Tolbert, Senior Process Engineer at United States Mint
- J. Marc Landry, Plant Manager at United States Mint
- Jason M. Goodman, Senior Advisor to the Treasurer, Department of the Treasury, Bureau of Engraving and Printing
- Douglas C Albright, Counterfeit Specialist at Department of the Treasury, Counterfeit Division
- Lorelei W. Pagano, Counterfeit Specialist at Department of the Treasury, Counterfeit Division
- B. B. Craig, Associate Director, Sales and Marketing, Department of the Treasury
- Robin Twyman, First Secretary, Trade Policy, Business Affairs and Trade, British Embassy, Washington
- Philip Barton, Deputy Head of Mission, British Embassy, Washington

The Royal Mint is the largest exporting mint in the world, supplying approximately 60 countries in an average year. So it is that the coins produced by The Royal Mint can offer important insights into the benefits not only to the United Kingdom but also, to a greater or lesser extent, for many other countries in the world.

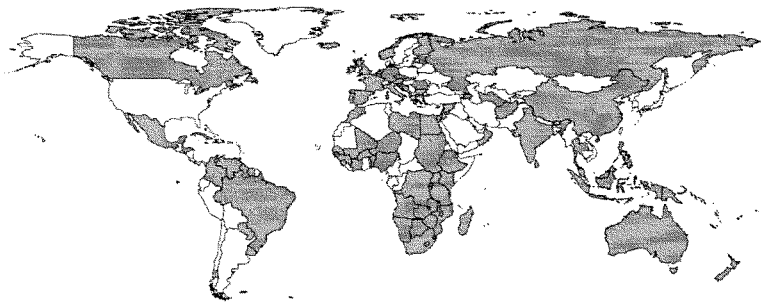
The Royal Mint's strategic aim is to work in partnership with currency authorities across global markets. In fulfilling this aim The Royal Mint will help to build economic capacity in developing nations and sustainable currency solutions in mature economies.

Throughout The Royal Mint's existence, the British coinage has remained its principal focus. But overseas work has become increasingly important – from a trickle in the late eighteenth century, it became a steady stream in the nineteenth and then a flood from the 1920s onwards.

The Royal Mint offers a wide variety of services. Examples that demonstrate the breadth include:

- Full mint refurbishment
- Full recoinages for different countries across the world
- Being sole supplier to many countries (only supplier ever to Jordan)
- Have provided specification consultancy to many countries, and were central to the specification of the Euro coinage
- Provide tooling and technical advice for many mints
- A unique coin management training programme for delegates from central banks and state mints.

Below is a map of countries that The Royal Mint has supplied with coins, coinage blanks, tooling or related services in the last 20 years:



SUMMARY

The Royal Mint is committed to supporting the implementation of secure and sustainable coinage distribution across global markets. It believes that coinage reform in the US will provide an exemplar for mature and developing economies.

The Royal Mint has noted the on-going review of the Concurrent Technologies Corporation report with much interest. In the light of this development it will be pursuing the following objectives:

- Advising the Federal Reserve and US Mint of its interest in the Concurrent Technologies Corporation/US Mint on-going assessment and related strategic currency matters
- Ensuring that Senate and Congressional scrutiny committees are made aware of the potential contribution that The Royal Mint could make to currency reform in the US
- Briefing US legislators involved in the analysis of currency reform in the US and offering to provide a qualitative input to their work and that of Senate/Congressional colleagues
- Seeking meetings with the US civil society groups with a stated interest in currency reform and sustainability

STATEMENT OF
RICHARD A. PETERSON
DEPUTY DIRECTOR
UNITED STATES MINT

BEFORE THE
SUBCOMMITTEE ON MONETARY POLICY AND TRADE:
HOUSE COMMITTEE ON FINANCIAL SERVICES
"Coin and Currency Production"

Wednesday, June 11, 2014

2128 Rayburn House Office Building

Chairman Campbell, Ranking Member Clay and Members of the Subcommittee, I appreciate the opportunity to appear before you once again today to discuss the United States Mint and U.S. coin production. I last testified before this Subcommittee in November of 2012, and I look forward to updating you on United States Mint operations and programs, as well as addressing your interest in circulating coins, our alternative metals research and development (R&D), and the United States Mint's bullion and commemorative coin programs.

I want to start by saying again that I have the honor of leading one of our Nation's oldest and most venerable public institutions. Congress established the United States Mint in 1792, and it is the largest in the world. We have a rich history and play a very important role in the financial fabric of our country. And none of this would be possible without our people. The United States Mint is a vibrant team of 1,700 dedicated men and women located here in Washington and at five facilities across the country—Philadelphia, West Point, Fort Knox, Denver, and San Francisco. By law, the United States Mint operates two fiscally separate programs: a circulating coin program and a numismatic products program that includes collectible coin and medal

products and our precious metal bullion coins.

Circulating Coin Costs and Efficiencies

As I testified in 2012, the United States Mint is committed to delivering our products at the lowest cost, and we delivered excellent results in Fiscal Year (FY) 2013. In FY 2013, our circulating coin operations shipped 10.7 billion coins to the Federal Reserve Banks, an increase of nearly 18 percent from the 9.1 billion shipped in FY 2012. The general and administrative (G&A) costs of our circulating coin operations decreased some $4.7 million—7.6 percent to $56.9 million in 2013 from $61.6 million in 2012. Since 2009 we have reduced these G&A costs by 42 percent. In short, our costs are down and our production is up. This resulted in $350 million of seigniorage being transferred to the Treasury General Fund, our first such transfer in three years.

I will now turn to a few specific topics as they relate to the hearing today, starting with a status report on our R&D efforts to find less costly alternative metallic materials for production of U.S. coinage.

Research and Development on Alternative Metals

In December 2012, we provided the United States Mint's first biennial report to Congress under the provisions of the "Coin Modernization, Oversight, and Continuity Act of 2010." The full

report, which discussed and summarized the findings of the R&D program in detail, is available on our website, www.usmint.gov.

That report detailed the establishment of the R&D laboratory at our Philadelphia facility and our work to date analyzing and testing various possible alternative metals for our coinage. Researchers tested hundreds of trial pieces made up of 29 different alloy combinations.

Since then, we have continued our efforts through:

- Additional testing of alternative metals;
- Conducting test production-scale runs to validate manufacturability, supplier capabilities, and costs;
- Verifying estimated costs to stakeholders associated with potential coin composition changes; and
- Continuing ongoing dialog and outreach with stakeholders.

At this juncture, there are several key points to share:

- The overarching mission of our circulating coin program is to facilitate commerce by minting and issuing coins in amounts that the Secretary of the Treasury decides are necessary to meet the needs of the United States. As our 2013 results demonstrate, the United States Mint currently is meeting that mission with a denomination portfolio that, as a whole, has generated positive seigniorage.

- Cash is, and will remain, an important method to settle financial transactions. Based on the results from the 2011 Survey of Consumer Payment Choice, an economist for the Federal Reserve Bank of Boston concluded that 65 percent of all transactions under $10 in value utilize cash and that 45 percent of all transactions under $25 in value utilize cash.[1]

- With coinage remaining an important part of our Nation's financial fabric for the foreseeable future, the main goal of the United States Mint's R&D effort is to identify feasible, less costly alternative metallic materials and production methods for all circulating U.S. coins.

- Our report in 2012 concluded that no alternative metal compositions would lower the cost of the one-cent coin, and that it is highly unlikely that the cost of minting and issuing the penny would ever fall below one cent.

- When other countries have made changes to their coinage and currency portfolios, a key to the success of the change is the effectiveness of the communication plan that explains what the change is, why it is happening, when it will happen, and how it will affect various stakeholders.

[1]Scott Schuh, Federal Reserve Bank of Boston, "Consumer Payment Choices in an Era of Innovation and Policy Intervention" presentation to NEACH Payments Markets Forum, February 14, 2013. Data taken from "2011 Survey of Consumer Payment Choice," Bureau of Economic Analysis/Haver Analytics. The views expressed in this presentation do not necessarily represent the views of the Federal Reserve Bank of Boston or the Federal Reserve System. Results from the 2011 Survey of Consumer Payment Choice (SCPC) are preliminary and subject to change.

- Changing the metallic composition of the coin denominations commonly used in vending will affect a variety of stakeholders, both large and small businesses, in different ways. The United States Mint is actively seeking feedback from industry stakeholders in areas such as vending, parking meters, coin-operated laundry, amusement, public transportation, banking, and supermarkets. We hosted a stakeholder outreach event that was very well attended, and we are actively seeking input from these groups and the public at large with multiple surveys and requests for public comment.

- We will also be soliciting comments on the public's use of coins in financial transactions and views on alternative coin options. We will use this feedback on consumer behavior and preferences in our analysis of cost-saving options for all denominations.

Our next report to Congress is due in December of this year, and we are committed to providing you with thorough and accurate information for you to use in considering any potential changes to U.S. coinage.

Investment-Grade Bullion Coins

One of our missions is to mint and issue gold and silver bullion coins to meet the needs of precious metal investors. We are the largest producer of gold and silver bullion coins in the world. We also have the discretion to mint and issue platinum bullion coins, but we suspended their production in 2009, in order to devote our resources to meeting the enormous increases in gold and silver bullion coin demand. Earlier this year, however, we resumed sales of one-ounce

American Eagle Platinum Bullion Coins. We listened to our customers, the American public, who indicated that they wanted this precious metal restored to our portfolio of investment-grade coin offerings.

Our American Eagle Gold and Silver Bullion Coins are the coins of choice for investors around the world, and the United States Mint set a new record for unit sales in FY 2013. Over the years, we have seen demand for our silver bullion coins increase from 8 million coins in FY 2007 to approximately 43 million in FY 2013. This dramatic increase led to shortages of silver blanks from our suppliers during some periods, which forced the allocation of silver bullion coins. We have successfully worked with our blank suppliers to increase their capacity and supply of blanks to the United States Mint.

Within the last two months, however, demand for silver bullion coins worldwide, including our American Eagles, has shown signs of weakness, as investors apparently have focused more on other competing investment classes. Increased production and waning demand have allowed us to begin carrying over unsold silver bullion coin inventory each week to the point at which we now have a sufficient number of coins produced to meet demand and lift allocations.

We produce all our gold and platinum bullion coins and approximately 80 percent of our silver bullion coins at the United States Mint in West Point, New York. We produce the remainder of our silver bullion coins at Philadelphia and San Francisco. Our bullion coin program is a manufacturing success story, and we thank our suppliers, our network of authorized distributors, and, most importantly, our manufacturing team, for their contributions to this important program.

Commemorative Coin Programs

Since 1982 Congress has authorized 66 commemorative coin programs to honor people, places, events, and institutions of significance in American history and culture. The United States Mint is proud to administer these programs.

Surcharges from the sales of these coins are authorized to help fund a variety of organizations and projects that benefit the public at large. These coin programs have generated more than $500 million in surcharges for the designated recipient organizations.

The Commemorative Coin Reform Act of 1996 made the recipient organizations partners in bearing the risks of the programs and ensures that the United States Mint recovers the costs of operating the programs. Since 1997, these programs have operated at no cost to the taxpayer. We keep costs of production as low as possible by utilizing manufacturing best practices such as standardized product packaging, bulk purchasing, and make-to-order fulfillment. On the sales side, we leverage the recipient organizations' existing publications and other communications channels to generate interest in the commemorative coin programs among the organizations' key supporters and affinity groups.

We have two important and high-profile commemorative coin programs in 2014–the Civil Rights Act of 1964 and the National Baseball Hall of Fame Commemorative Coin Programs. The baseball program features curved coins–the first ever produced by the United States Mint. Their designs reflect the looks and convex and concave shapes of an actual baseball and glove.

The Civil Rights Act of 1964 Commemorative Coins went on sale January 2 and the National Baseball Hall of Fame Commemorative Coins March 27. The gold and silver National Baseball Hall of Fame Coins sold out in a matter of days–in the case of the gold, a matter of hours.

The United States Mint is actively engaged in regular outreach efforts and public awareness events for both programs that include Members of Congress such as John Lewis and your full committee Ranking Member Maxine Waters, various National Baseball Hall of Fame members, and leaders and others affiliated with their recipient organizations.

The recent Beacon Awards Luncheon and Civil Rights Baseball Game in Houston May 29-30 gave us the rare opportunity to highlight both our current commemorative coin programs on one stage as we promoted and sold both coins.

Mr. Chairman, the United States Mint is a cost-effective, open, transparent organization that is meeting its core mission to produce circulating, precious metal bullion, and numismatic coins and medals to meet the needs of the Nation. I invite you to look at our FY 2013 annual report, available on our Web site at http://www.usmint.gov/about_the_mint/?action=annual_report.

It remains my honor to serve as the leader of the United States Mint, and I thank you for your interest in our activities. I am pleased to answer any questions that you and the Members of the Subcommittee may have.

Thank you.

United States Government Accountability Office

Testimony

Before the Subcommittee on Monetary Policy and Trade, Committee on Financial Services, House of Representatives

For Release on Delivery
Expected at 11:30 a.m. ET
Wednesday, June 11, 2014.

U.S. CURRENCY

Actions Needed to Improve Coin Inventory Management

Statement of Lorelei St. James,
Director, Physical Infrastructure

GAO-14-601T

GAO Highlights

Highlights of GAO-14-601T, a testimony before the Subcommittee on Monetary Policy and Trade, Committee on Financial Services, House of Representatives

June 11, 2014

U.S. CURRENCY

Actions Needed to Improve Coin Inventory Management

Why GAO Did This Study

Efficiently managing the nation's inventory of circulating coins helps to ensure that the coin supply meets the public's demand while avoiding unnecessary production and storage costs. This testimony is based on GAO's October 2013 report on the Federal Reserve's management of the circulating-coin inventory. It addresses (1) how the Federal Reserve manages the circulating coin inventory and the related costs, (2) the extent to which the Federal Reserve follows key practices in managing the circulating-coin inventory, and (3) actions taken to respond to potential changes in demand for currency (coins and notes).

What GAO Recommends

GAO's October 2013 report included several recommendations to the Federal Reserve to ensure the efficient management of the coin inventory and potentially to reduce costs. These included recommendations (1) to develop a process to assess factors influencing coin operations costs and identify practices that could lead to cost-savings and (2) to establish additional performance goals and metrics relevant to coin inventory management. The Federal Reserve generally agreed with the report's recommendations and, in response, has developed a plan for addressing them.

What GAO Found

In 2009, the Federal Reserve centralized coin management across the 12 Reserve Banks and established national inventory targets to track and measure the coin inventory. However, based on GAO's analysis of Federal Reserve data, from 2008 to 2012, total annual Reserve Bank coin-management costs increased by 69 percent, and more specifically, costs at individual Reserve Banks increased at rates ranging from 36 percent to 116 percent. GAO found in October 2013 that the Federal Reserve did not monitor coin management costs by each Reserve Bank—instead focusing on combined national coin and note costs—thus missing potential opportunities to improve the cost-effectiveness of coin-related operations. Furthermore, the agency had not taken steps to systematically assess factors influencing coin management costs and identify practices that could lead to cost savings.

In managing the circulating-coin inventory, the Federal Reserve followed two of five key inventory management practices GAO identified and partially followed three. For example, the agency followed the key practice of collaboration because it has established multiple mechanisms for sharing information related to coin inventory management with partner entities such as depository institutions. The Federal Reserve partially followed the key practice of performance metrics, which involves identifying goals, establishing performance metrics, and measuring progress toward goals. While the Federal Reserve had developed some performance metrics of upper and lower national coin-inventory targets, it had not developed goals or metrics to measure other aspects of its coin supply-chain management, such as costs. Establishing goals and metrics, such as those related to coin management costs, could aid the Federal Reserve in using information and resources to identify additional efficiencies.

To collect data and information on potential changes in the demand for currency (coins and notes), the Federal Reserve has conducted studies and outreach with groups such as depository institutions and merchants, and found a general consensus that the use of currency may decline slightly in the near term. This expectation is due, in part, to an increase in alternative payment options (e.g., additional forms of electronic payments), but interrelated factors—such as technological change and economic conditions—make it difficult to predict long-term currency demand. In 2010, the Federal Reserve began to develop a long-term strategic framework to consider potential changes to currency demand over the next 5 to 10 years and how this change could affect operations. This effort includes, among other things, examining internal operations for distributing coins and processing notes as well as conducting research into the use of payment types to understand currency use in the United States to better position the agency to adapt to future changes in demand.

View GAO-14-601T. For more information, contact Lorelei St. James, (202) 512-2834, stjamesl@gao.gov.

Chairman Campbell, Ranking Member Clay, and Members of the Subcommittee:

I am pleased to be here today to participate in this hearing that examines the Federal Reserve System's management of the circulating coin inventory. Efficiently managing the nation's inventory of circulating coins helps to ensure that the coin supply meets the public's demand while avoiding unnecessary production and storage costs. The Federal Reserve System's 12 Federal Reserve Banks (Reserve Banks) fulfill the coin demand of the nation's depository institutions (e.g., commercial banks, federal savings associations, and credit unions) by managing coins held in inventory and ordering new coins from the United States Mint (U.S. Mint). In 2013, the U.S. Mint produced 10.7 billion coins. According to the Department of the Treasury (Treasury), coins worth approximately $42.6 billion were in circulation at the end of fiscal year 2012. The Federal Reserve System is comprised of a Board of Governors (Board) and the Reserve Banks, which are self-funded entities that engage in a variety of activities that generate revenue, such as earnings from lending to financial institutions. The costs of operating the Federal Reserve System are deducted from these revenues, and the remaining amount is transferred to the General Fund of the U.S. Treasury (General Fund). In 2012, the Federal Reserve System transferred $88.4 billion to the General Fund.

In October 2013, we issued a report on the Federal Reserve's management of the circulating coin inventory and made several recommendations to the Federal Reserve to ensure the efficient management of the inventory and potentially to reduce costs.[1] My statement today is based on that report and addresses (1) how the Federal Reserve manages the circulating-coin inventory and the related costs, (2) the extent to which the Federal Reserve follows key practices in managing the circulating-coin inventory, and (3) actions taken to respond to potential changes in demand for currency (coins and notes). For the October 2013 report, we interviewed federal and foreign officials, experts, and industry representatives; reviewed documents and data on coin inventories; and compared the Federal Reserve's coin inventory management practices to key practices in supply-chain management.

[1]GAO, *U.S. Currency: Coin Inventory Management Needs Better Performance Information*, GAO-14-110 (Washington, D.C.: Oct. 28, 2013).

More detailed information on our objectives, scope, and methodology for that work can be found in the issued report. We conducted the work on which this statement is based in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Inventory Management Has Been Centralized; Rising Costs Have Not Been Analyzed

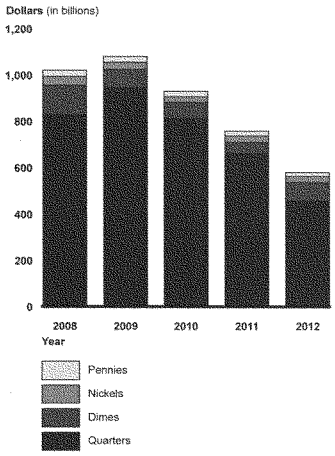
Coin Inventory Management

In 2009, the Federal Reserve centralized coin management across the 12 Reserve Banks and established national inventory targets. Previously, each Reserve Bank office set and managed its own inventory levels, resulting in varying levels of inventory held relative to demand. Under the centralized approach, the Federal Reserve's Cash Product Office (CPO) manages distribution of the coin inventory, orders new coins, and acts on behalf of the Reserve Banks in working with stakeholders, such as depository institutions. From 2008 through 2012, the combined inventory for pennies, nickels, dimes, and quarters decreased 43 percent, due, in part, to the centralized program.[2] (See fig. 1.) In 2009, CPO also established national upper and lower inventory targets for pennies, nickels, dimes, and quarters to track and measure the coin inventory. CPO officials noted that these targets help meet their primary goal in managing the nation's coin inventory: ensuring a sufficient supply of all coin denominations to meet the public's demand. The upper national-inventory target serves as a signal for CPO to reduce future coin orders from the U.S. Mint to avoid the risk of approaching coin-storage capacity

[2]Our October 2013 report focused primarily on inventory management of pennies, nickels, dimes and quarters. Due to the December 2011 Treasury decision to cease production of new $1 coins for circulation, the Federal Reserve's current management of the $1-coin inventory is focused on managing those $1 coins already in storage or circulation.

limits and the lower national-inventory target serves as a signal to CPO that there is a need to increase future coin orders to avoid shortages. We analyzed national inventory targets from 2009 to 2012 and found that in most cases these targets were met.

Figure 1: Reserve Bank Coin Inventory, 2008-2012



Source: GAO analysis of Federal Reserve data. | GAO-14-601T

In managing the coin inventory, CPO determines if coins should be transferred from an area with more coins than needed to fulfill demand or if additional coins should be ordered from the U.S. Mint. If there is an insufficient supply of coins to meet demand and transferring coins from another location would not be cost-effective, CPO orders new coins from the U.S. Mint based on its 2-month rolling forecast of expected demand. After submitting orders to the U.S. Mint, CPO may increase an order or defer shipments to later months based on updated information. In part to

respond to these changes, each month the U.S. Mint produces a safety stock of coins.[3]

Coin Management Costs

Our analysis found that in 2012, Reserve Bank costs related to coin management were approximately $62 million.[4] To monitor costs related to currency management, including coins as well as notes, CPO officials said they review these costs at the national level because individual Reserve Banks may vary in their accounting for operational costs related to coins and notes. In October 2013, we found that from 2008 through 2012 total annual Reserve Bank currency-management costs increased by 23 percent at the national level.

While cost information for coins and notes is available separately, CPO does not separately monitor the Reserve Bank's coin management costs. Looking specifically at coin management costs, which include direct and support costs, our analysis found that they increased by 69 percent from 2008 through 2012. More specifically, Reserve Bank direct costs for coin management increased by 45 percent during this period, about $5 million across the 28 offices, and support costs increased by 80 percent, about $19.6 million across these offices. Direct costs include personnel and equipment. CPO officials attributed the increase in coin management costs mainly to support costs. Support costs include utilities, facilities, and information technology as well as other local and national support services such as CPO's services.

Although Reserve Bank coin management costs have risen since 2008, we found in October 2013 that CPO had not taken steps to systematically assess factors influencing direct and support costs related to coin management and assess whether opportunities exist to identify elements of its coin inventory management that could lead to cost savings or greater efficiencies across the Reserve Banks. We also found that the rates of increasing coin management costs differ across Reserve Banks. Specifically, using data provided by CPO on individual Reserve Banks'

[3]Producing a safety stock helps the U.S. Mint respond to changes in monthly coin orders as well as seasonal changes in coin demand. If the safety stock is not applied to the current coin order, it can be used to fill future orders.

[4]Reserve Bank costs include the CPO's administration, coin handling, and interbank coin transfer costs. U.S. government costs related to coin management also include costs for the U.S. Mint's production and distribution of new coins.

costs, from 2008 through 2012, coin management costs increased for all Reserve Banks, with the increases ranging from a low of 36 percent to a high of 116 percent. The Federal Reserve's 2012–2015 strategic plan includes an objective to use financial resources efficiently and effectively.[5] In addition, according to a leading professional association that provides guidance on internal controls, as part of the internal control process, management should ensure that operations, such as managing an inventory, are efficient and cost effective, and this process includes monitoring costs and using this information to make operational adjustments.[6] Without taking steps to identify and share cost-effective coin management practices across Reserve Banks, the Federal Reserve may be missing opportunities to support more efficient and effective use of Reserve Bank resources. To address this issue, in our October 2013 report we recommended that the Federal Reserve develop a process to assess the factors that have influenced increasing coin-operations costs and the large differences in costs across Reserve Banks and to use this information to identify practices that could lead to costs savings. We concluded that taking these actions may help the Federal Reserve identify ways to improve the cost-effectiveness of its coin management, potentially increasing the revenues that are available for the Federal Reserve System to transfer to the General Fund. The Federal Reserve generally agreed with the recommendations in our report, including the above recommendation as well as recommendations discussed below, and has developed a plan for addressing them. In response to the recommendations, the Federal Reserve also noted that it would define a new metric that measures the productivity of Reserve Bank coin operations and that will enable it to monitor coin costs and identify cost variations across Reserve Banks. We will continue to monitor the Federal Reserve's progress in addressing our recommendations.

[5]Federal Reserve System, *Strategic Framework 2012-15* (2013).

[6]Committee of Sponsoring Organizations of the Treadway Commission (COSO), *Internal Control—Integrated Framework* (1992). COSO is a joint initiative of five professional associations dedicated to providing thought leadership through the development of frameworks and guidance on enterprise risk management, internal control, and fraud deterrence.

The Federal Reserve Follows Some Key Practices in Managing the Circulating-Coin Inventory but Lacks Others

In October 2013, we found that the Federal Reserve, in managing the circulating-coin inventory, follows two of five key inventory management practices we identified and partially follows three. Establishing, documenting, and following these key practices contributes to a more effective inventory-management system.[7] Specifically, the Federal Reserve follows key practices for collaboration and risk management and partially follows key practices for performance metrics, forecasting demand, and system optimization. For example, it follows the key practice of collaboration because it has established multiple mechanisms for sharing information related to coin inventory management with partner entities such as depository institutions. In addition, the Federal Reserve follows the risk management key practice because it has identified sources of potential disruptions, assessed the potential impact of risk, and developed plans to mitigate risk at multiple levels of its operations.

In the key practice area of performance metrics, we found that the Federal Reserve has developed some metrics in the form of upper and lower national coin-inventory targets. However, it has not developed other goals or metrics to measure other aspects of its coin supply-chain management—such as costs. Characteristics of this key practice include agencies' identifying goals, establishing performance metrics, and measuring progress toward those goals. We concluded that establishing goals and metrics, such as those related to coin management costs, could aid the Federal Reserve in using information and resources to identify additional efficiencies. To address this issue, we recommended that CPO establish, document, and annually report to the Board performance goals and metrics for managing the circulating coin inventory and measure performance toward those goals and metrics. In its response, as noted previously, the Federal Reserve said that it planned to define a new metric that measures the productivity of the Reserve Bank's coin operations and use this metric to monitor coin costs.

In the key practice area of forecasting demand, we found that the Federal Reserve forecasts future coin demand and uses this information to make decisions, but does not systematically track the accuracy of its monthly

[7]To effectively manage inventory, private and governmental organizations involved in production and distribution operations use supply-chain and operations-management practices. We identified five key supply-chain practices and selected supporting characteristics for each that are applicable to coin inventory management to assess the Federal Reserve's management of the circulating-coin inventory.

forecasts compared to the final coin orders. Our analysis of initial monthly CPO coin orders and final orders (actual U.S. Mint coin shipments) from 2009 through 2012 indicated that initial orders were consistently less than the final orders. A leading operations management industry association that offers professional certifications recommends that forecasting results must be continuously monitored and a mechanism should be in place to revise forecasting models as needed, and that if the forecast consistently exhibits a bias, the forecast should be adjusted to match the actual demand. We concluded that taking additional steps to assess forecast accuracy could help CPO identify the factors influencing forecast accuracy and then adjust forecasts to improve accuracy. To address this issue, we recommended that CPO establish and implement a process to assess the accuracy of forecasts for new coin orders and revise the forecasts as needed. In its response, the Federal Reserve reported that in addition to implementing a more formal program for assessing new coin order forecasts, CPO has begun working to refine the accuracy of its coin forecasts.

In the key practice area of system optimization, we found that CPO does not fully use available information and resources to optimize system efficiencies within the supply chain. Specifically, it does not use the range of information available to establish and track performance metrics to measure progress. Better information related to forecast accuracy and costs—such as the types of information we recommended that the Federal Reserve develop—could aid CPO in using its information and resources to identify inefficiencies and further support the interrelated key practice of system optimization. For example, the U.S. Mint's monthly production of new coins could be more efficient with improvements to the accuracy of initial new-coin orders. In part to improve this linkage, we concluded that optimizing U.S. Mint's and individual Reserve Bank's operations could potentially contribute to reducing U.S. Mint or Federal Reserve costs related to circulating coins.

Demand for Currency Expected to Decline Gradually in the Near Term, but a Variety of Factors Make Predicting Longer-Term Change Difficult

To collect data and information on potential changes in the demand for currency, the Federal Reserve has conducted studies and outreach with groups such as depository institutions and merchants, and found a general consensus that the use of currency may decline slightly in the near term. According to the Federal Reserve, this expectation is due, in part, to an increase in alternative payment options (e.g., additional forms of electronic payments), but interrelated factors—such as technological change and economic conditions—make it difficult to predict long-term (i.e., 5 to 10 years) currency demand. According to many agency officials, stakeholders, and foreign government officials we spoke to, while there may be changes in the use of various types of payments in the coming years, the effect on currency demand is likely a gradual decline.

Federal Reserve officials expect that their current procedures and approach to managing the coin and note inventory—including their forecasting and monitoring of the coin inventory targets discussed previously—will allow the agency to accommodate gradual shifts in demand. For example, to respond to increasing or decreasing demand for coins, CPO can decrease or increase coin orders from the U.S. Mint. According to the officials we met with, CPO is continually working to identify ways to streamline its processes to be more flexible and adaptable to changes, and CPO and the Reserve Banks have established plans and procedures, such as risk management plans, to address the effects associated with short-term, unexpected changes in coin and note demand. Experts we interviewed agree that well-managed currency systems are capable of handling major trend-based changes. According to inventory management experts we consulted, dependable forecasts—that take both trends and cyclical demand changes into account—are key to effectively managing a supply chain. Therefore, we concluded in our October 2013 report that combining forecasts with continual tracking of demand and inventory levels should allow the Federal Reserve to be able to adapt to any major trend-based changes in coin and note demand. As discussed earlier, this makes accurate forecasting by the Federal Reserve even more important.

While Federal Reserve officials we met with indicated their current processes should enable them to adapt to gradual changes in coin and note demand, a significant and unexpected change could affect the management of the coin and note inventories. CPO officials said that if a large decline in coin usage occurs, they would adapt their management of the inventory in response. For example, if demand for coins were to decrease suddenly, leaving too many coins in circulation, the Federal Reserve would first stop ordering new coins from the U.S. Mint and would

then focus on storing the excess coin inventory. Coin attrition would reduce this inventory over time, and CPO officials anticipate that they would have sufficient storage capacity available to accommodate the excess coins. CPO officials told us that inventory levels would need to be well in excess of the existing targets before they would have an effect on storage capacity and related costs. While coin terminal operators did not expect a decrease in coin demand significant enough to exceed their storage capacity, additional storage could be needed to accommodate and store the coins returned by depository institutions to the Reserve Banks if there is a substantial decrease in public demand for coins.[8]

In 2010, CPO began to develop a long-term strategic framework to consider potential changes to currency demand over the next 5 to 10 years and how this change could affect CPO's operations. According to Federal Reserve officials, this framework is an internally focused effort to help share information, refine internal operations, and monitor trends. One component of this effort includes examining internal operations for distributing coins and processing notes as well as seeking to increase efficiency in these areas to better position the agency to adapt to future changes in demand. Conducting research is another component of this framework. For example, as part of a broader effort to look at trends in various payment types, one Reserve Bank is examining the detailed spending habits of a selection of consumers, who were asked to document their transactions and payment decisions over a period of time in a shopping "diary." Because determining how much of the currency in circulation is being used for transactions is difficult, this type of study may help officials better understand currency use in the United States. Australian, Austrian, and Canadian officials we interviewed for our 2013 report were also exploring the potential impact of alternative payment technologies and collecting new data to inform research efforts. For example, Austrian and Canadian officials have also conducted diary studies to better understand individuals' use of various payment options. Collecting detailed consumer-payment information through these types of studies may help officials better understand consumers' payment and currency management habits.

[8]Coin terminal operators are armored carrier companies such as Brink's and Dunbar that hold both Reserve Bank and other customers' coins in their facilities.

In conclusion, the Federal Reserve has taken steps to standardize its management of the circulating-coin inventory from a national perspective, steps that have led to improvements such as reductions in national coin inventories. The actions that it has planned to address our recommendations could potentially contribute to reducing federal costs related to circulating coins, a reduction that could increase the amount of money returned to the General Fund. While the Federal Reserve has a framework that it believes can adapt to expected gradual changes in coin demand, a significant and unexpected decrease in demand could lead to increased storage needs.

Chairman Campbell, Ranking Member Clay, and members of the Subcommittee, this concludes my prepared statement. I would be pleased to answer any questions at this time.

GAO Contact and Staff Acknowledgments

For further information on this testimony, please contact Lorelei St. James, at (202) 512-2834 or stjamesl@gao.gov. In addition, contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Individuals making key contributions to the work this testimony is based on include Teresa Spisak and John Shumann (Assistant Directors); Maria Wallace; Amy Abramowitz; Lawrance Evans, Jr.; David Hooper; Delwen Jones; Sara Ann Moessbauer; Colleen Moffatt Kimer; and Josh Ormond.

This is a work of the U.S. government and is not subject to copyright protection in the United States. The published product may be reproduced and distributed in its entirety without further permission from GAO. However, because this work may contain copyrighted images or other material, permission from the copyright holder may be necessary if you wish to reproduce this material separately.

GAO's Mission	The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.
Obtaining Copies of GAO Reports and Testimony	The fastest and easiest way to obtain copies of GAO documents at no cost is through GAO's website (http://www.gao.gov). Each weekday afternoon, GAO posts on its website newly released reports, testimony, and correspondence. To have GAO e-mail you a list of newly posted products, go to http://www.gao.gov and select "E-mail Updates."
Order by Phone	The price of each GAO publication reflects GAO's actual cost of production and distribution and depends on the number of pages in the publication and whether the publication is printed in color or black and white. Pricing and ordering information is posted on GAO's website, http://www.gao.gov/ordering.htm. Place orders by calling (202) 512-6000, toll free (866) 801-7077, or TDD (202) 512-2537. Orders may be paid for using American Express, Discover Card, MasterCard, Visa, check, or money order. Call for additional information.
Connect with GAO	Connect with GAO on Facebook, Flickr, Twitter, and YouTube. Subscribe to our RSS Feeds or E-mail Updates. Listen to our Podcasts. Visit GAO on the web at www.gao.gov.
To Report Fraud, Waste, and Abuse in Federal Programs	Contact: Website: http://www.gao.gov/fraudnet/fraudnet.htm E-mail: fraudnet@gao.gov Automated answering system: (800) 424-5454 or (202) 512-7470
Congressional Relations	Katherine Siggerud, Managing Director, siggerudk@gao.gov, (202) 512-4400, U.S. Government Accountability Office, 441 G Street NW, Room 7125, Washington, DC 20548
Public Affairs	Chuck Young, Managing Director, youngc1@gao.gov, (202) 512-4800 U.S. Government Accountability Office, 441 G Street NW, Room 7149 Washington, DC 20548

Please Print on Recycled Paper.

Statement by Former Representatives Jim Kolbe and Tim Penny

Honorary Co-Chairman of the **Dollar Coin Alliance**

Wednesday, June 11 at 11:30 A.M.

The Monetary Policy and Trade Subcommittee

Mr. Chairman, Members of the Committee, we appreciate the opportunity to submit testimony today. We are former Members of Congress, and are currently honorary Co-Chairman of the Dollar Coin Alliance, a 20 member organization composed of businesses, government watchdogs groups, labor unions, transit associations and others dedicated to the transition from the dollar bill to the dollar coin.

This hearing is focused on the cost of currency. There are many ways to make our currency production more efficient, but there is no better cost effective way than to move to the dollar coin. The United States could save up to $13.8 billion over 30 years by modernizing our one-dollar currency, all without cutting a single program or raising a single tax.

Then why has it taken so long to move to the dollar coin? The reasons are not surprising. Having two currencies for the same denomination rarely works. People will always default to the mode with which they are most familiar. It is a mistake to interpret the mild embrace of the dollar coin by the public as unpopular. In fact, opinion polls consistently show that, when informed of the savings of substituting a dollar coin for the dollar note, two-thirds of Americans support making the switch.

To this point, when the Mint launched the Sacagawea dollar in 2000, it was forced to bypass the Federal Reserve Board (FRB) impediments and ship the coins directly to Wal-Mart stores nationwide. In just a few weeks, Wal-Mart distributed 100 million Sacagawea dollars as change in routine retail transactions, demonstrating that Americans welcomed the new coin.
In addition, as alluded to above, the FRB is opposed to the dollar coin. Because the FRB is able to purchase dollar bills from the Bureau of Printing and Engraving at cost, roughly 5.5 cents, and sell them at face ($1), they make 94 cents profit on each bill. However, the FRB must buy dollar coins from the US Mint at face value, and so make no profit. Because the FRB is not incentivized, they have thrown up many road blocks to get dollar coins into circulation. In other words, the Fed makes money with the dollar bill, and doesn't with the dollar coin, even though the Federal Government will save up to $13.8 billion dollars! The US is one of the few nations where the Treasury does not reap the profit of currency production.

In addition, the United States is the only industrialized nation in the world that still circulates a single denomination paper note. Nearly every other country has switched to a dollar coin. Why? Because coins are more durable, they last longer, and are more environmentally friendly. Most importantly - they can save governments a considerable amount of money. A single dollar coin will replace 17 dollar bills in its lifetime – and then it can be recycled to replace 17 more, resulting in billions in savings for taxpayers.

The budget savings is one of the many reasons why the Government Accountability Office – the US government's own budget watchdog – has recommended we modernize our dollar currency repeatedly over the last 20-plus years. It's the reason that members from both political parties, and in both chambers of Congress, came together earlier this year to introduce the Currency Optimization Innovation and National Savings (COINS) Act (S. 1105 and H.R. 3305).

With a divided Congress often unable to agree on big issues, it's important that they pay attention to the simple, common sense and bipartisan proposals like the dollar coin that can generate real savings for taxpayers. The dollar coin makes it easy for members of Congress to reach across the aisle, and start to reduce the deficit without cutting a single program, or raising a single tax.

Supporting the COINs Act – modernizing our one-dollar currency by eliminating the wasteful dollar bill in favor of the dollar coin - is a step in the right direction. The COINS Act is Congress' chance to start generating the savings we need to address our country's budget issues. We urge this Committee to take up H.R. 3305 as the best, most effective way to modernize our currency.

For release on delivery
11:30 a.m. EDT
June 11, 2014

Statement of Louise L. Roseman

Director

Division of Reserve Bank Operations and Payment Systems

Board of Governors of the Federal Reserve System

Submitted to the Subcommittee on Monetary Policy and Trade

of the

Committee on Financial Services

U.S. House of Representatives

June 11, 2014

Chairman Campbell, Ranking Member Clay, and members of the Subcommittee, thank you for inviting me to submit a statement for the record on behalf of the Board of Governors of the Federal Reserve System for the hearing entitled "The Production and Circulation of Coins and Currency." I welcome the opportunity to update the Subcommittee on activities of the Federal Reserve related to currency developments and management of coin distribution.

Roles in Currency and Coin Distribution

First, it may be helpful to describe briefly the Federal Reserve's role in currency and coin distribution. Each year, the Federal Reserve Board projects the need for new currency, which it acquires from the Bureau of Engraving and Printing (BEP) within the Department of the Treasury, at approximately the cost of production. The Board issues the nation's currency in the form of Federal Reserve notes, which are liabilities on the books of the Reserve Banks. The Reserve Banks distribute currency and coin for general circulation through depository institutions. The Reserve Banks also receive deposits of currency and coin from these institutions. Currently, 28 Reserve Bank cash offices provide cash services to approximately 8,700 banks, savings and loans, and credit unions in the United States. The remaining depository institutions obtain currency and coin from correspondent banks rather than directly from the Federal Reserve. The value of Federal Reserve notes in circulation as of May 29, 2014, was more than $1.2 trillion, which represents, on average, an increase of nearly 8 percent per year over the past five years.[1]

The Federal Reserve's role in coin operations is more limited than its role in currency operations. The United States Mint issues circulating coins that the Reserve Banks purchase at face value and record as assets on their balance sheets. The U.S. Mint determines annual coin

[1] Board of Governors of the Federal Reserve System (2014), Statistical Release H.4.1, "Factors Affecting Reserve Balances" (May 29).

production; however, the Reserve Banks influence the process by providing the U.S. Mint with monthly coin orders and a 12-month, rolling coin-order forecast. The Reserve Banks distribute new and circulated coin to depository institutions to meet the public's demand and take as deposits coin that exceeds the public's needs. The Reserve Banks store coin in their vaults and also contract with coin terminals to store and distribute coin on their behalf.[2] Armored carrier companies operate the coin terminals, which have improved the efficiency of the coin-distribution system. The value of U.S. coins in circulation as of May 29, 2014, was approximately $43 billion, or about 3.5 percent of total currency and coin in circulation.[3]

Currency Redesign

Maintaining the integrity of and confidence in U.S. currency is a shared responsibility among the Treasury, the BEP, the Federal Reserve, and the United States Secret Service (USSS). These agencies work collaboratively to redesign Federal Reserve notes in order to improve their security and protect the public from counterfeiters. Through an interagency cooperative agreement, these agencies make up the Advanced Counterfeit Deterrence Steering Committee (ACD) and recommend design changes to the Secretary of the Treasury, who has sole statutory authority to approve new currency designs. Although U.S. currency is designed as a family of notes, decisions about each denomination are guided by the ACD's evaluation of the range of counterfeit threats--from digital technology to traditional printing processes--and by advancements in banknote security features.

---

[2] These armored carrier companies do not charge the Reserve Banks a fee for these services. In the 1990s, the Federal Reserve and the armored carrier companies reached a mutually beneficial agreement that the armored carriers would provide coin services to depository institution customers on behalf of the Federal Reserve at no cost in exchange for access at the armored carrier terminals to Reserve Bank coin inventories, which significantly reduced the transportation expenses incurred by the armored carriers in obtaining the coin from Reserve Bank locations.

[3] Board of Governors, Statistical Release H.4.1.

The U.S. government redesigns its currency primarily for security reasons. Finding the right set of security features to address specific counterfeiting threats requires years of development work. New features must be innovative and easy for the public to use, but difficult for counterfeiters to simulate. New designs must also include characteristics and features that can be effectively used by banknote equipment manufacturers to denominate and authenticate currency, and must meet specific requirements of the Federal Reserve to guarantee authenticity.

Beginning in 1996, the United States produced the first major redesign of U.S. currency in 65 years (the Series-1996 design family). This redesign began with the $100 note in March 1996 and concluded with the $5 and $10 notes issued together in May 2000. The 1996-design family incorporated new security features, such as portrait watermarks, embedded security threads, and color-shifting ink to combat the predominant threat of the professional counterfeiter. To address a phenomenon known as "opportunistic counterfeiting," or the use of digital technology by non-professional or casual counterfeiters to simulate notes, the ACD recommended another redesign of the currency, which began with the $20 note in October 2003; followed by the $50 note in 2004; the $10 note in 2006; the $5 note in 2008; and most recently, the $100 note in October 2013.[4]

The redesigned $100 note builds on the ACD's efforts to improve security for new notes and includes state-of-the-art features such as the 3-D security ribbon and the color-shifting bell in the inkwell. As of April 30, the Federal Reserve had distributed 2.2 billion redesigned $100 notes--18 percent of the nearly 9.6 billion $100 notes in circulation. The launch of the redesigned $100 note was a partnership between the BEP, the USSS, the State Department, and the Board. Because one-half to two-thirds of the value of U.S. currency--predominately the $100

[4] The Board had previously announced that the redesigned $100 note would begin circulating in February 2011, but had to postpone the introduction because of production problems.

note--circulates abroad,[5] educational seminars and public education events were planned at U.S. embassies and consulates worldwide and were aimed at educating global users about the redesign of the $100 note, the new security features, and how to authenticate them. This educational effort began with issuance of the note and is ongoing.

The ACD is in the early stages of identifying and developing new security features and processes to address a wide range of ongoing counterfeiting threats from around the world. Developing new security features and integrating them into a banknote design effectively is a complex and time-consuming process. The design of U.S. currency must be resilient to counterfeiting threats, as well as address the needs of a global user base. In addition, our nation's currency must perform reliably in sophisticated authentication and fitness-sorting machines around the world. Finally, there are a growing number of automated transactions, using equipment ranging from bill acceptors at self-checkouts to high-speed sorting equipment at financial institutions and the Federal Reserve. These machines have differing levels of technological sophistication and make use of numerous characteristics in the notes to determine authenticity and fitness.

U.S. currency needs to be not only highly secure but also accessible for blind and visually impaired persons.[6] There are a variety of methods and evolving technologies on the market that could assist with providing meaningful access. The current design family of notes includes large, high-contrast numerals on the reverse side of the notes, and the BEP has developed an application for smartphones that denominates notes quickly and accurately. The Board also

---

[5] See www.federalreserve.gov/paymentsystems/coin_about.htm.

[6] The BEP has been working to meet the requirements of a 2008 court order requiring the Secretary of the Treasury to provide meaningful access for individuals who are blind or visually impaired to denominate U.S. currency. The court has accepted the Treasury's recommendation to continue using the large, high-contrast numeral on all redesigned notes, to develop and implement a tactile feature in the next redesign of notes, and to develop a currency reader program.

supports the BEP's currency reader program, which will provide currency readers to visually impaired individuals free of charge. Additionally, we are working with the BEP to evaluate various tactile features based on usability, durability, cost, and risk. Cost and risk to society are significant with this project, as machine manufacturers may need to adjust transport and sensor systems, and banks and armored carriers may need to increase vault and truck capacity to accommodate thicker notes. Durability is also a challenge because Federal Reserve notes facilitate commerce throughout the world and are subjected to many different climates and uses. The Federal Reserve will continue to work with the BEP and other stakeholders to evaluate and recommend solutions that effectively meet the needs of the blind and visually impaired community.

Currency Production Quality

The Board and the BEP are engaged collaboratively in establishing a quality assurance program at the BEP. The foundation of this initiative is to produce notes more efficiently, integrate security features more effectively, and align note designs more intently with production constraints and circulation needs. Through these and other improvements, we expect to achieve significant cost savings in future years by reducing spoilage and increasing production efficiency. The improvement of the BEP's quality system will more effectively and efficiently produce future currency designs that better meet the needs of the public.

Management of Coin Distribution

The Federal Reserve implemented a program to manage coin distribution from a national perspective beginning in 2008, which has improved the efficiency of the Reserve Banks' coin activities. Before the Federal Reserve moved to centralized management of coin distribution, each Reserve Bank made independent ordering and distribution decisions. Today, the Reserve Banks' Cash Product Office (CPO) manages coin nationally for the Federal Reserve, taking into

account the Reserve Banks' input regarding local estimates of coin demand. The CPO produces a consolidated monthly coin order on behalf of the Reserve Banks for the U.S. Mint. Along with the order, the CPO provides the U.S. Mint with a 12-month, rolling coin-order forecast for planning purposes. The order and forecast are developed based on expected net payments and Reserve Banks' coin inventory levels and are targeted to ensure sufficient inventories are positioned at each Reserve Bank office and coin terminal to meet the forecasted demand.

As a result of improved inventory management, the Reserve Banks have been able to use inventories of previously circulated pennies, nickels, and dimes more efficiently to fill orders from depository institutions, rather than new coins.[7] Reserve Bank orders for new coins of these denominations are about 38 percent less than the average orders in the six years before the centralized inventory-management program began. The CPO is also testing a new concept of coin exchanges, whereby it identifies participating depository institutions with net supply of or demand for coin based on ordering and depositing patterns, and the Reserve Banks facilitate the transfer of coin directly between those institutions and settle the transactions on the institutions' accounts at the Reserve Banks. If successful, the coin exchanges will reduce transportation and coin handling expenses.

In a recent report, the Government Accountability Office (GAO) recognized the improvements the Federal Reserve has made to its coin inventory management and its collaboration with supply chain stakeholders.[8] To further improve efficiency, the GAO recommended that the Board direct the Reserve Banks to (1) develop a process to assess coin operations costs, (2) establish performance metrics for managing coin inventory, and (3)

---

[7] The 50 State Quarters and Presidential $1 Dollar Coin programs resulted in Reserve Banks building significant inventory of coins. Driven by public demand, these inventories could not be reduced to efficient levels as quickly as the other denominations. By the end of 2013, inventories of quarters declined to efficient levels, but Reserve Bank inventories of $1 coins have held steady at about 1.4 billion pieces for the past two years.

[8] Government Accountability Office (2013), *U.S. Currency: Coin Inventory Management Needs Better Performance Information* (Washington: GAO, November 27), www.gao.gov/products/gao-14-110.

implement a process to assess the accuracy of forecasts for new coin orders. The Board generally agrees with the report's recommendations to further improve coin management and is working with the CPO to implement them. The CPO is defining new metrics to measure the productivity and cost of Reserve Bank coin operations and is working with its vendor to refine the accuracy of forecasted coin demand.

Metal Content of Coins

As the issuing authority for banknotes, the Federal Reserve appreciates the importance of identifying and incorporating cost-effective materials into the production of our nation's money. Changing the metal content of pennies and nickels, which could change the weight and electronic signature of the coins, would not have a material adverse effect on the operations of the Reserve Banks. In fact, the Reserve Banks stopped routinely weighing penny and nickel deposits a decade ago, after concluding that the small dollar value of the differences found were more than offset by the cost of weighing the coin bags. Instead, the Reserve Banks credit depository institutions' accounts for deposits of coin on a "said to contain" basis. Changing the metal content of dimes, quarters, half-dollars, and $1 coins--if it changes the respective weights--could, however, affect Reserve Bank coin terminal operations. Coin terminal operators generally weigh incoming deposits for these denominations.

A change in a coin's weight or electronic signature could also affect businesses that use coin-accepting machines or sorting equipment that relies on these characteristics to identify coins by denomination, such as the vending industry, armored carriers, and some commercial banks. Those businesses are in a better position to comment on the extent to which they would be required to modify equipment to recognize coins of the same denomination that have different weights and electronic signatures.

Conclusion

The Federal Reserve will continue to work to meet demand for currency and coin efficiently and effectively and collaborate with our partners at Treasury, the BEP, and the USSS to develop designs and security features that protect the public from counterfeiting.

Hearing before the Subcommittee on Monetary Policy and Trade on June 11, 2014

"The Production and Circulation of Coins and Currency"

Question from Rep. Mike Fitzpatrick for Richard A. Peterson, Deputy Director, United States Mint, Department of the Treasury

1. **The Fed claims the 1.3 billion $1 coins in storage are enough to meet demand for the next 40 years, but isn't this assuming that we do not modernize our currency? Is it fair to say that if we were to eliminate the paper dollar, then all of those $1 coins would immediately go into circulation and new production would be needed as well?**

Mr. Peterson response:

The Federal Reserve has not ordered $1 coins from the United States Mint since 2011. However, if Congress eliminated or phased out the $1 note as several other countries have done, we believe the public would come to accept the use of the $1 coin in commerce. The 1.3 billion $1 coin inventories would decline, and over some period of time, the Federal Reserve would request the United States Mint to manufacture additional $1 coins to meet the needs of commerce.

Cong. Michael Fitzpatrick
Monetary Policy and Trade Subcommittee
June 11, 2014

Questions:

Lorelei St. James, Senior Executive and Director of Physical Infrastructure issues, Government Accountability Office:

1. **In 2011, the GAO reported the $1 note lifespan had increased from 18 months to 40 months. Then in 2012 GAO reported this increased to 56.4 months. Now, the Federal Reserve states that the lifespan is over 70 months. However, the Fed also states that demand and destruction rates have remained the same since 2011 and they predict it to stay the same in 2014. These two claims seem to contradict each other. If the lifespan is increasing and demand for notes stable, shouldn't the destruction rates go down?**

In 2011, we reported that the lifespan of the $1 note had increased from 18 months in 2001 to 40 months in 2011. We also stated that Federal Reserve and Treasury officials told us that additional improvements in the processing of $1 notes would occur later in 2011. In 2012, we reported that the Federal Reserve had begun using new equipment in April 2011 to process notes, and this increased the expected life of the note to an average of 56 months. According to the Federal Reserve, the expected life span is now 70 months because the Federal Reserve has now had more than a full year with the new equipment, so the average lifespan has increased. This new equipment also decreased the destruction rates from about 27 percent in 2006 to about 15 percent in 2011. At this point, the Federal Reserve expects the destruction rates—which determine how long a given note lasts on average— to remain fairly constant.

2. **On that same point, Ms. Saint James, my understanding is that GAO understandably trusts the data provided by the Federal Reserve and uses it in their calculations.**
   - **GAO does not sample or otherwise verify lifespan data accuracy, is that correct?**
   - **My understanding is that dollar note lifespan is one or the most significant factors in estimating savings, and that GAO has also thoughtfully provided in its Reports much higher alternative savings estimates, including one where Fed projections of future increased note lifespan don't work out. Is that correct?**

GAO did not independently assess or verify the lifespan data estimates, but we met with Federal Reserve officials who described to us the nature of technological improvements that have led to reduced premature shredding of notes. They also described to us the method they used to estimate note life. The method described appeared well designed

and we do not have any concerns that the life of the note is being inappropriately measured.

In our analysis of potential savings from replacing the $1 note with a $1 coin, the findings we have provided over the past few years are sensitive to our model assumptions regarding the lifespan of a dollar note. Because notes last so much longer today than they did just a few years ago – 70 months vs. 40 months - the savings from replacing the $1 note with a $1 coin would be lower than we previously estimated, and there may no longer be any savings at all.

Larry R. Felix, Director, Bureau of Engraving and Printing, Department of Treasury

Lorelei St. James, Senior Executive and Director of Physical Infrastructure issues, Government Accountability Office

1. **It's my understanding that the BEP and the Mint manufacture based on what the Fed orders. Is that correct?**

That is correct, though the process differs based on the Federal Reserve's authorities related to coins and notes.

For coins, the U.S. Mint is the issuing authority. The 12 Federal Reserve Banks (Reserve Banks) fulfill the coin demand of the nation's depository institutions (e.g., commercial banks, federal savings associations, and credit unions) by managing coins held in inventory and ordering new coins from the U.S. Mint. In managing the coin inventory, the Federal Reserve's Cash Product Office (CPO) determines if coins should be transferred from an area with more coins than needed to fulfill demand or if additional coins should be ordered from the U.S. Mint. If there is an insufficient supply of coins to meet demand and transferring coins from another location would not be cost-effective, CPO orders new coins from the U.S. Mint based on its 2-month rolling forecast of expected demand. After submitting orders to the U.S. Mint, CPO may increase an order or defer shipments to later months based on updated information. The U.S. Mint's facilities in Philadelphia and Denver produce and ship new coins for circulation to Reserve Bank office and coin terminals. In 2013, the U.S. Mint produced 10.7 billion coins.

For notes, the Federal Reserve Board is statutorily responsible for note issuance, distribution, and processing.[1] The Board submits an annual note order to the BEP, and BEP produces notes based on that order.

As I noted in my testimony, while we often read that there are 1.4 billion dollar coins in Federal Reserve inventory, we don't hear about Treasury's ongoing reporting that there are concurrently 4.5 billion dollar coins in circulation.
There is one other important point needed for context. We all know that having any kind of coin shortage is totally unacceptable, and to prevent that, the Federal Reserve spreads out

[1] 12 U.S.C. §§ 411 and 414.

coin inventory in some 200 different locations across the country. The Fed has testified that they store coins in 174 coin terminals or depots, in addition to more than 30 Federal Reserve Banks and Branches. So it's very important to have enough coin, hundreds of millions if not billions, in all of those locations to meet demand immediately, for all denominations.
GAO's report last November on Coin Management provided very helpful data. From analysis of circulating coin inventory, there were at the time an average, on any given day, about 2.8 billion quarters, 2.1 billion pennies, nearly 1 billion dimes, and more than ½ billion nickels in combined Federal Reserve and coin terminal inventory.

2. **Is that a fair general description of the coin inventory?**

The description of how the Federal Reserve spreads coin inventory across numerous locations nationwide above is generally correct, but the data analysis referenced is not from our October 2013 report. The inventory of pieces of coins on a given day fluctuates significantly based on the flows of payments to and receipts from depository institutions for each coin denomination. According to CPO officials, demand for coin fluctuates throughout the year based on seasonal changes in public demand and receipts from depository institutions and these fluctuations in coin demand can be volatile. The data used in our October 2013 report focused on annual inventory levels for each coin denomination represented in dollar value.

In October 2013, GAO reported Reserve Banks held about 5 percent ($2.1 billion) of the 2012 circulating coin inventory, and 95 percent ($42 billion) of the inventory was in general circulation. As of December 2012, the 28 Reserve Bank offices held about 50 percent of the Reserve Banks' total coin inventory of pennies, nickels, dimes, and quarters and about 92 percent of the Reserve Banks' total coin inventory of $1 coins. The 170 coin terminals held the remainder of the Reserve Bank's coin inventory. In managing the coin inventory, CPO determines if coins should be transferred from an area with more coins than needed to fulfill current and future demand or if additional coins should be ordered from the U.S. Mint.

Lorelei St. James, Senior Executive and Director of Physical Infrastructure issues, Government Accountability Office

Richard A. Peterson, Deputy Director, United States Mint, Department of Treasury

1. **The Fed claims the 1.3 billion $1 coins in storage are enough to meet demand for the next 40 years, but isn't this assuming that we do not modernize our currency? Is it fair to say that if we were to eliminate the paper dollar, than all of those $1 coins would immediately go into circulation and new production would be needed as well?**

The Federal Reserve reports that the Reserve Banks currently hold more than 40 years of $1 coin inventory, assuming continuation of current levels of demand. The Federal Reserve's current management of the $1 coin inventory is focused on managing those $1 coins already in storage or circulation. If a policy decision was made to eliminate the

$1 note, demand for $1 coins would increase. As a result, those $1 coins held in inventory would begin circulating with the rest of the national coin supply, and the U.S. Mint would need to begin producing new $1 coins for circulation to meet increased demand.

Andrew Mills, Director of Circulating Coin, The Royal Mint, United Kingdom

1. In the UK, the highest denomination coin is 2 pounds which is worth over 3 dollars, more than 13 quarters to be precise. Mr. Mills, how receptive is the public in England to these coins and how has it affected taxpayers and the economy?"

At the coin hearing on June 11th, Ranking Member Clay asked Lorelei St. James if she could estimate the cost to store the $1 coin going forward. Her response is below:

For all coins including the $1, the Reserve Bank inventories are stored at coin terminals, which also receive deposits from and fulfill coin orders for depository institutions on behalf of the Reserve Banks and other customers. Coin terminals operate at no cost to the government because they earn revenue from depository institutions for coin transportation and wrapping services.

In 2011, the Federal Reserve had planned to spend about $650,000 to expand storage capacity at the Federal Reserve Bank of Dallas to hold the excess $1 coins. However, in 2012, the Fed decided not to construct the facility after Treasury decided to stop production of the $1 coin. Since Treasury decided to stop producing the $1 coin, the number of coins in inventory has leveled off at about 1.4 billion. While that's a lot, coin terminals have existing storage for the coins. The coin terminal operators and other stakeholders we spoke with did not expect a decrease in coin demand (for all denominations) significant enough to exceed their existing storage capacity in the next 5-10 years.