REGULATED LIABILITY NETWORK
UK DISCOVERY PHASE
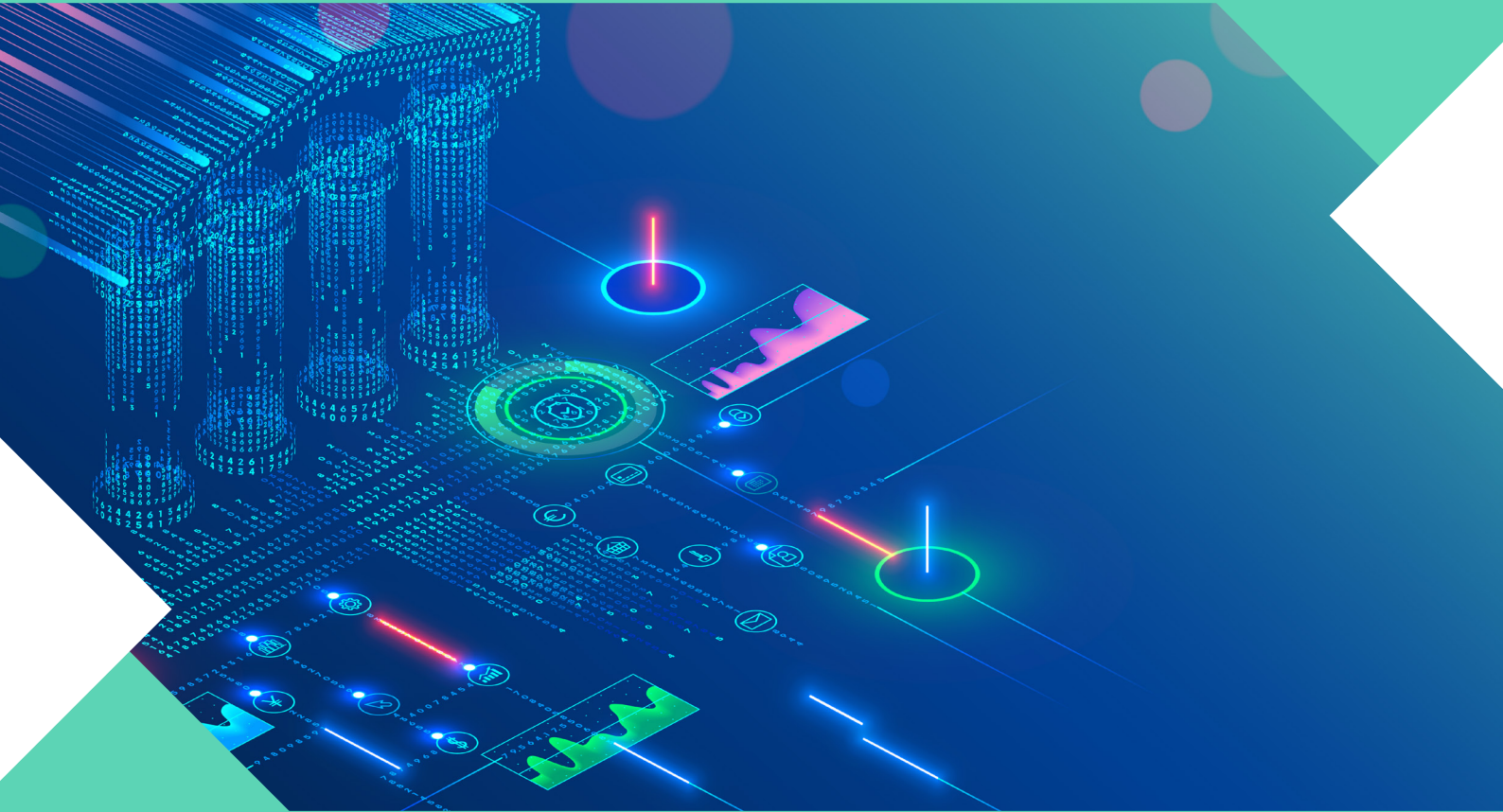
CONTENTS

1. EXECUTIVE SUMMARY

1.1 THE RLN CONCEPT

- **The Regulated Liability Network (RLN)** concept is "a regulated Financial Market Infrastructure (FMI) that would operate a shared ledger that records, transfers, and settles regulated liabilities of central banks, commercial banks, and regulated non-banks."

- RLN is a design for regulated digital sovereign currency that is not limited to central bank liabilities.

1.2 WHY RLN?

There has been, and continues to be, significant innovation within payments and accelerated development / discussion regarding new forms of digital money, including public and private initiatives.

These private initiatives are largely being led independently by different entities and stakeholders, and there is a question if they go far enough.

Settlement of different forms of money across different payment domains (such as domestic, cross-border, retail, wholesale, and securities) often remains jurisdiction and domain specific, increasing fragmentation and inefficiency across the market.

- Often these entities issue tokens and assets that are unbacked and operate outside of the UK regulatory framework. This could be a risk to the UK economy and threatens the continued singleness of, and trust in, the pound sterling (GBP).

- The RLN initiative, therefore, could further the UK innovation landscape, promoting collaboration across the public and private sectors, while providing UK consumers with better tools to remain in control of their money through a unified settlement solution.

- The RLN initiative, therefore, seeks to promote collaboration across the public and private sectors, with the aim of helping to drive long-term interoperability, sustainability, and efficiency of regulated money.

- In 2022, **over £1.2 billion** was stolen by criminals through authorised and unauthorised fraud in 2022. The most common form of Authorised Push Payment (APP) scam cases were purchase scams (57 per cent accounting for £67 million lost). The functionality provided by RLN could potentially help consumers control their payments better, which may potential prevent fraud.

1.3 WHY NOW?

- This concept is already being explored in the **USA** and experimented in other jurisdictions, albeit under different names. Most notably in **Switzerland** with the work by the Swiss National Bank and SIX Digital Exchange. The Bank for International Settlements (BIS) is also promoting the same concept as the **Unified Ledger**.

- The BoE is designing a retail central bank digital currency (CBDC) called the '**Digital Pound**'.

- In his '**New prospects for money**' speech given at the Financial and Professional Services Dinner on 10 July 2023, Andrew Bailey, the Governor of the BoE, stated 'We want to encourage more thinking and action in the world of enhanced digital bank deposits – sometimes call tokenised deposits. So, yes, this is a call to action particularly to banks – don't leave central banks as the only show in town.'

- It is therefore important that the UK continues to explore the RLN concept, since it is an integral part of the **future of money**.

1.4 PURPOSE OF THE UK RLN DISCOVERY PHASE

- A previous **UK pilot** looked at the opportunities and challenges of establishing RLN and explored instant settlement for domestic and international (UK-US) transactions.

- UK Finance and a number of its members and interested parties (the RLN participants) came together to continue to explore the RLN concept through a Discovery Phase.

- The Discovery Phase explored three use cases in detail, covering the business, technology, and regulatory aspects of each. In addition, the use cases enabled identification of hypotheses that could be tested and the feasibility of a PoC.

Use Case #	Use Case Description
1	**Consumer domestic payment** (Delivery versus Payment with locking functionality)
2	**Wholesale B2B cross-border payment** (multi-currency)
3	**Securities Settlement** (repurchase agreement)

1.5   SUMMARY OF KEY FINDINGS

- There are **potential benefits of having tokenised regulated money and assets on a single ledger**, which can provide superior customer journeys due to programmable functions, atomic settlement, liquidity optimisation, automation of processes, interoperability, and orchestration between participants.

- Central bank partitions on RLN and programmable payments in central bank money (e.g. wholesale CBDC) could be the foundation for general-purpose programmable payments in commercial bank money.

- **Five different architectures have been identified** that could deliver RLN. These range from orchestration through to all parties having a partition on the network, which means the concept can be scaled and expanded in a journey as confidence increases.

- To achieve the ambitions of RLN, **close engagement with official institutions (including central banks, regulators and governments) is necessary to agree on FMI requirements** and establish settlement assets.

1.6   CONCLUSIONS AND NEXT STEPS

- The Discovery Phase met its objectives, by answering key questions that were pre-requisites for an Experimentation Phase, which would comprise the design, build and execution of one or more PoCs.

- The Experimentation Phase for RLN in the UK could be a sequential journey, which includes PoCs for all three use cases over a period. The infrastructure and architecture for the first PoC should be designed so it can be extended to all use cases and in principle taken forward into a fully operational production solution. This would truly test the viability of the RLN concept.

- The current policy priority to explore a retail CBDC in the UK means **that the consumer domestic payment is the recommended use case for the first PoC**.

- The consumer domestic use case would help explore how 'upgraded' commercial bank money could sit alongside a retail CBDC, how RLN could accommodate both forms of money on a single infrastructure, and how the functional equivalence[1] of all retail digital money could be ensured. It could also potentially test if upgraded commercial bank money and RLN can provide a more effective platform for innovation.

- The RLN participants now have the information required to scope and plan an Experimentation Phase.

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1   Barclays recently **released a paper** that defined functional consistency for money as "the principle that different forms of money have the same operational characteristics". The paper explored common operational characteristics and key capabilities in order to evaluate the suitability of various design options to support functional consistency across the digital pound and commercial bank money.

2. INTRODUCTION

2.1   BACKGROUND

UK Finance members believe that significant benefits can be realised from innovations in financial services, particularly programmable payments, and the tokenisation of assets/liabilities. Despite various initiatives enhancing traditional payments and settlement systems in the UK, like **RTGS Renewal**, **Omnibus Account model** and the **New Payments Architecture**. Incremental enhancements to the current system design may not deliver the level of innovation necessary to make the UK future ready.

In particular, the BoE is exploring a retail CBDC or '**Digital Pound**'. However, designing the infrastructure with a focus only on digital central bank money could leave critical benefits to the industry unexplored. The development of a programmable, multi-asset platform could deliver enhanced functionality that a CBDC could not achieve on its own.

There could also be advantages to promoting broader mutual collaboration to design a unified approach for the future of regulated money in the UK, where all pounds are sufficiently smart and interoperable. Similarly, there could be advantages of public-private cooperation to develop new multi-asset settlement infrastructures that provide true innovation for the UK market. This is the thinking behind the RLN.

This is why it is important that the UK continues to explore the RLN concept, build on the **2022 work** and remain at the forefront of this type of innovation.

2.2   RLN CONCEPT

There has been significant innovation in the last ten years surrounding the development of new forms of digital money, including public (CBDC) and private initiatives. However, these initiatives are largely being led independently by different entities and stakeholders. This may lead to a fragmented landscape and even risks breaking the functional equivalence of money. Many of these platforms, where privately led, are not explicitly captured by existing regulation and capital requirements. This means that UK consumers using these platforms may not be protected by supporting consumer protections that the UK economy has grown to depend on.

There could be advantages to promoting broader mutual collaboration to design a unified approach for the future of regulated money in the UK, where all pounds are sufficiently smart and interoperable. A future where people in the UK use regulated money as their preferred store of value and preferred medium of exchange in today's markets and new, emerging digital markets.

The RLN initiative seeks to promote collaboration across the public and private sectors, with the aim of helping to drive long-term interoperability, sustainability and efficiency of regulated money while ensuring the wider benefits of the last ten years of experimentation are not lost. As referred to in the executive summary, the concept is already being tested in the other jurisdictions, albeit under different names.

It is important to note that RLN is not an account operator, and the tokenised liabilities are not a claim on RLN. Instead, the tokenised liabilities held on the network (e.g. commercial bank deposits) remain a claim on the RLN participant (e.g. commercial banks), since the RLN partitions are an extension of the participants own books and records. A tokenised liability on RLN is unlikely to be a bearer instrument, instead the tokenised liabilities would likely be linked to existing customer accounts. Although this may not be a binary distinction, as there could be merit in exploring certain tokenisation qualities that may enable peer-to-peer transfers.

2.3   INITIAL OBJECTIVES

The goal of the UK RLN Discovery Phase was to investigate the optimum use case(s) for a RLN PoC in the UK. The participants set out to answer key questions that could help inform their decision on whether to take part in an Experimentation Phase, which could comprise of a design, build and execution of one or more PoCs. Objectives of the Discovery Phase included:

- Identifying hypotheses that could be tested in subsequent phases

- Understanding the feasibility for a PoC and RLN functionalities demonstrated

- Documenting examples of use case flows and to understand the business implications

- Examining regulatory and legal considerations

- Identifying and exploring the technology architectures and options

2.4   SCOPE OF DISCOVERY PHASE

UK Finance and a subset of its members and interested parties came together to explore the RLN concept, with EY as the project management office. The work was guided by a Steering Committee (SteerCo), which comprised of one person per firm and was co-chaired by UK Finance with one of the members and with Ernst & Young LLP (EY UK) as Secretariat. There were three underlying workstreams, which covered the business, technology, and regulatory aspects.

The Discovery Phase was an eight-week programme aimed at identifying the optimum use case(s) for a PoC in the UK. This phase built on the original RLN work in the UK and sat alongside the RLN work in the USA. The three use cases listed in section 1.4 were selected to emphasise the necessary functionality, interconnections and level of orchestration that would be involved for RLN. This, in turn, helped influence the decision regarding the architecture of RLN, the business impact, the regulatory considerations and the value derived from a PoC for each use case. All of which was the basis for the prioritisation framework.

When exploring the consumer domestic use case, a number of other use cases were suggested such as the home buying journey, purchasing concert tickets and marketplace platform payments (e.g. online food delivery). For example, there are more than 30 potential retail use cases listed in the **Project Rosalind** final report, which tested the potential functionality, adoption and innovation of a retail CBDC in the UK. It was suggested that these use cases should also be considered in any Experimentation Phase, as it would be beneficial to explore how they could be delivered by all forms of retail digital money, rather than by retail CBDC only.

2.5   PRIORITISATION FRAMEWORK

A summary of the prioritisation framework is included below, which was based on four key factors:

i.   Hypotheses testing

ii.   Demonstration of RLN functionality

iii.   Impact analysis

iv.   Feasibility assessment

2.5.1   Hypotheses testing

The RLN participants agreed 12 hypotheses that are important to the RLN initiative and started to explore them during the Discovery Phase. The use cases should test and help prove/disprove these core hypotheses.

Hypothesis	Description
Tokenisation thesis	Can a shared ledger of tokenised liabilities enable functional consistency of assets (central bank money, commercial bank money, and other regulated instruments) between regulated institutions and enable more efficient transaction processing and settlement finality?
Settlement finality	Can tokenised liabilities represented on a shared ledger (or a collection of linked shared ledgers) directly constitute the participants' entity balance sheet without requiring further intra-participant reconciliation, such that atomic settlement on the ledger is irrevocable and final, and not dependent on a subsequent off-ledger process?
Multi-Asset	Are shared ledgers able to represent multiple tokenised liabilities / assets (including retail and / or wholesale public money) and could this reduce fragmentation?

Hypothesis	Description
Efficiency	Can a shared ledger reduce frictions and delays to settlement execution to enable more efficient liquidity management? How much efficiency is lost when settlement is off ledger?
Programmability	Can smart contracts on a shared ledger enable more programmable payments and settlement, including with both central bank money and commercial bank money, compared to a flexible workflow engine running on a centralised ledger?
FMI	What level of oversight and regulation is required to underpin a shared ledger that transfers, records and settles different liabilities/assets?
Compliance	Can bringing data and money closer together enable enhanced Know-Your-Customer, Anti-Money Laundering and sanctions processing?
Tokenisation	Can existing legal instruments (assets) be represented and transacted on shared ledgers (through tokenisation) without changing their legal nature?
Orchestration	What level of oversight and regulation is required to underpin an overlay service that orchestrates interoperability and functional consistency across all forms of money?
Standards vs. Orchestration	Are common standards sufficient to enable interoperability and functional consistency across all forms of retail money and payment systems, or would an orchestration capability also be required?
Interoperability	How would a new shared ledger integrate and interoperate with existing payment rails and market infrastructure, plus upcoming infrastructure such as the BoE platform model and RTGS renewal, through full integration or synchronisation, and what are the technology/efficiency implications of each option?
System of Record	What are the golden sources of data for the network? Does it include the concept of an authoritative data store?

2.5.2   Demonstration of RLN functionality

The prioritisation framework should consider if the use cases demonstrate the full functionality and capability of RLN. The use cases are aimed at testing the RLN concept, so should emphasise the relevant functions, features and capabilities of RLN, which can be applied more broadly across financial services. For example, the features and orchestration needed for the payment upon delivery of online goods could also be applied to a home buying journey or purchasing tickets to a concert.

This, in turn, would influence the decision regarding the architecture. Subsequently, we would consider the value derived from that architecture in the PoC. We can also explore how the absence of such architecture would impact the world.

2.5.3   Impact analysis

The prioritisation framework should consider the impact of each use case to see if it delivers benefits to parties such as consumers, businesses and financial institutions. They should also aim to have a positive impact and drive benefits compared to what is currently available or being planned.

That includes impact across different spectrums, including different business, technology and regulation criteria. The analysis is based on the workshop discussions and findings, new process flows, and supporting data and inputs.

2.5.4   Feasibility assessment

In order to assess whether an RLN use case was feasible to achieve, each use case was reviewed from a business, regulatory and technology feasibility perspective. Therefore, the prioritisation framework should consider the practical feasibility of the PoC, including any challenges.

3. KEY FINDINGS

This section provides details of the key findings from the Discovery Phase summarised in section 1.5 along with the rationale and recommendation for the experimentation phase.

3.1 ANALYSIS OF USE CASES

When exploring the 'payment upon physical delivery' **consumer domestic use case**, a number of other use cases were suggested such as the home buying journey, purchasing concert tickets and marketplace platform payments (e.g. online food delivery) as referred to in section 2.4. This use case could help test if the infrastructure can handle higher throughput and offer greater resilience, as well as further test the 'functional equivalence of money' hypothesis, as the BoE progresses the digital pound through its design phase.

The securities settlement use case is a compelling use case. It could provide an opportunity to test the maximum functionality, interconnections and level of orchestration that would be involved with RLN. It could also align strategically with the timeline for regulatory developments in the UK, namely RTGS Renewal (testing interoperability with a new settlement system) and the **Digital Securities Sandbox**.

The wholesale cross-border payment use case may be the least feasible for a PoC. As the analysis found, this is due to the complexity of dealing with multiple jurisdictions, participants (including central banks) and regulatory requirements. However, if this use case is selected as the third stage of the Experimentation Phase it may allow time for the RLN concept and work to mature in the UK as well as other jurisdictions. So, it could become more feasible in the future.

3.2 STRATEGIC RATIONALE AND RECOMMENDATION FOR EXPERIMENTATION PHASE

There is a wider strategic rationale to consider in the UK with the potential issuance of a retail CBDC (or Digital Pound) that could have transformative effects in innumerable areas of the payments and banking ecosystem, as well as introduce complexity and fragmentation, including for the uniformity of money.

In February 2023, the BoE issued a consultation paper and accompanying technology working paper for a retail CBDC that states a Digital Pound is "likely to be needed in the UK". The BoE and Bank for International Settlements (BIS) also published the final report from Project Rosalind in June 2023, which further tested the potential functionality, adoption and innovation of a retail CBDC in the UK. The report offered up more than 30 potential use cases for a retail CBDC, showing even more intent from the authorities to develop the digital pound concept in the UK following the BoE shifting into the 'Design Phase' (2023-2025).

Therefore, it is recommended that the consumer domestic payment use case should be the first PoC for any Experimentation Phase. This use case would help explore how 'upgraded' commercial bank money could sit alongside a retail CBDC, how RLN could accommodate both forms of money on a single infrastructure, and how the functional equivalence of all retail digital money could be ensured. It could also potentially test if upgraded commercial bank money and RLN can provide a more effective platform for innovation.

Choosing this use case as the first PoC, would ensure the RLN infrastructure is designed with a high throughput capacity and resilience from the outset, rather than having to amend it at a future date. It also has lower potential regulatory complexity than cross-border payments and would allow for exploration of enhanced KYC, AML and sanctions screening. This use case could also enable participants to explore how RLN may potentially help reduce fraud through the PoC, which could drive significant benefits for consumers, businesses and financial institutions in the UK.

After addressing digital money payments and settlement via the consumer domestic payment use case, i**t is recommended the securities settlement use could be the second PoC, as it would test the multi-asset concept**. The Experimentation Phase could then **conclude with a cross-border payment PoC**, which could involve linking up with the US RLN work.

4. BUSINESS FINDINGS AND CONSIDERATIONS

The business workstream explored three use cases and completed the following for each:

- Identified the benefits

- Conducted a feasibility assessment

- Defined and documented the user journey.

4.1 USE CASE 1: RETAIL – CONSUMER DOMESTIC PAYMENT (DELIVERY V PAYMENT WITH LOCKING FUNCTIONALITY)

4.1.1 Benefits

Consumer payments accounted for **86 per cent of the 40.4 billion UK payments made in 2021** with business payments making up the remaining 14 per cent. In the same year, the value of **Faster Payments and Bacs combined was £8.6 trillion**.

This use case explored a domestic transaction where a consumer purchases goods online (an Account-to-Account payment) with the delivery of items at a future date. In this case, the orchestration and programmability functions that RLN offers could provide the following benefits:

    i.   **Functional consistency**

    ii.   **Potential reduction in Authorised Push Payment (APP) scams**

    iii.   **Greater control for the consumer**

    iv.   **Improved settlement times**

i. Functional consistency: With the potential for a digital pound to have additional functionality (e.g. programmable payments and locking/ unlocking), RLN can help bring functional equivalence between commercial bank and central bank money, helping to ensure the continued singleness of GBP.

ii. Potential reduction in APP scams: In 2022, **over £1.2 billion** was stolen by criminals through authorised and unauthorised fraud in 2022. Around 57 per cent of the APP scam cases (accounting for £67 million) was lost to purchase scams, with the vast majority of losses being from personal accounts. The programmability function provided by RLN allows for all parties to agree to the transaction prior to any funds being sent, which could help identify and reduce such scams, **thereby directly benefiting consumers, merchants, and banks**. CEO's of the UK's largest banks wrote to the UK's prime minister urging the government to take further steps to combat "**the devastating impact fraud is having on people, businesses, and the UK economy**". The letter stated, "**Online fraud poses a strategic threat to the prosperity of the UK and impacts the credibility of, and confidence in, the economy and financial sector**".

iii. Greater control for the consumer: With the funds being securely locked, **this benefits the consumer who could have greater control should the goods not be delivered** or if the consumer is not satisfied that the order has been fulfilled.

iv. Improved settlement times: The atomic settlement functionality provided by RLN **could unlock liquidity efficiencies for commercial banks** by allowing for greater control over when retail transactions are settled, giving high priority payments immediate settlement while, at the same time, utilising deferred net settlement processes for lower priority transactions. This could reduce daily funding requirements and allow institutions to better manage overnight borrowing costs.

4.1.2   Feasibility assessment

Due to the domestic nature of this use case, it was concluded that further investigation of a retail use case would be feasible. The high number of participants involved such as merchants, delivery companies, etc. may be challenging but these could be simulated. The **Project Rosalind** work could help accelerate this use case.

4.1.3   Use case 1 journey mapping - illustrative

- All parties agree to the transaction prior to the merchant sending out the goods (these include the consumer, consumer's bank, the merchant, merchant's bank, and a delivery company).
- RLN allows for the funds to be securely locked with a commitment for the merchant to be paid upon successful delivery of the goods.
- Once the consumer is satisfied that the goods are delivered, and the order has been fulfilled (the exact method could vary but one example would be for the courier company to send the merchant proof of delivery) this would trigger the next step.
- RLN orchestrates atomic settlement allowing the consumer's bank to unlock the funds and the merchant's bank to transfer the funds to the merchant.
- A potential central bank partition on RLN could reflect the liabilities moving from the consumer's bank to the merchant's bank.

4.1.4   Example of consumer domestic use case flow (Delivery vs Payment with locking functionality)
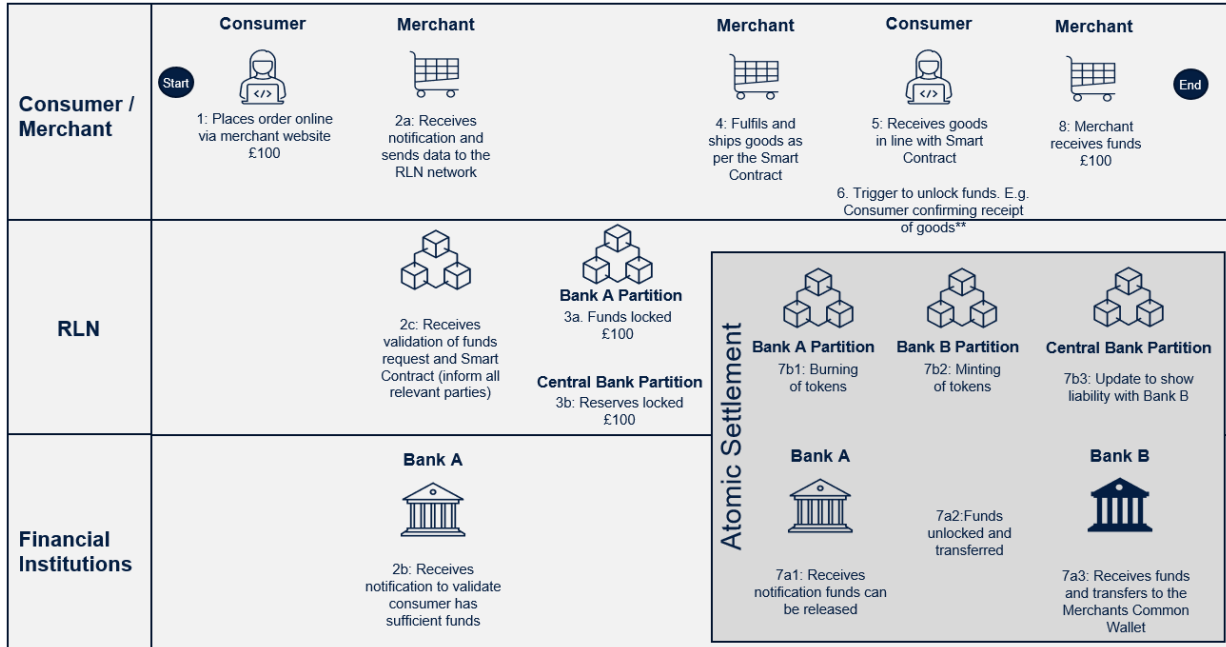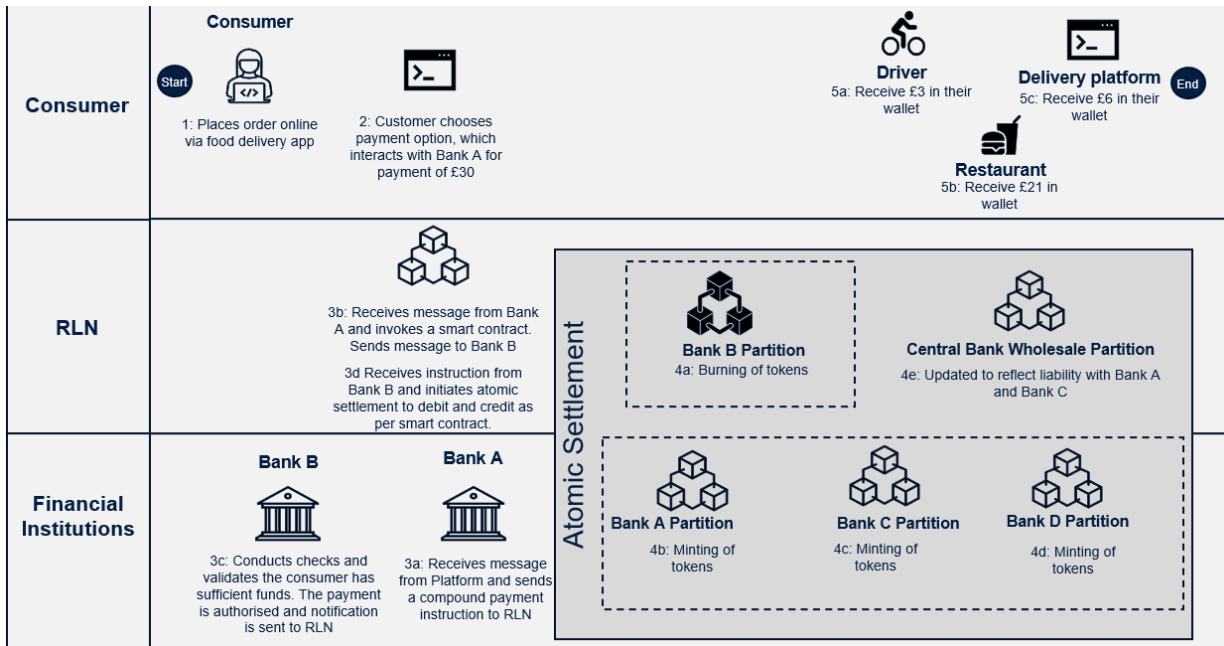

Key

Bank A = Consumer's bank

Bank B = Merchant's bank

4.1.5   Example of consumer domestic use case flow (marketplace platform payment)

Key

Bank A = Delivery Platform's bank

Bank B = Consumer's bank

Bank C = Driver's bank

Bank D = Restaurant's bank

4.2   USE CASE 2: WHOLESALE - CROSS-BORDER PAYMENT (MULTI-CURRENCY)

4.2.1   Benefits

The value of cross-border payments is projected to increase from almost **$150 trillion in 2017 to over $250 trillion by 2027, equating to a rise of over $100 trillion in just ten years**. There is the potential to continue to improve the cost, speed, access, and transparency of cross-border payments.

This use case explored a cross-border payment from a UK based business to a supplier based in the US to settle an invoice. In this case, the orchestration and programmability functions that RLN offers, could provide the following benefits:

   i.   **Improved speed and cost**

   ii.   **Reduced FX risk**

   iii.   **Improved settlement times and 24/7 liquidity**

   iv.   **Simplification of process**

i. Improved speed and cost: While the **median end to end processing time of a cross-border payment to the UK is less than 15 minutes**, in some instances, a cross-border **payment from the UK to other regions can take several days** to be credited to the beneficiary, for example due to capital controls and operating hours, and **can cost up to ten times more than a domestic payment**. Due to all parties being able to agree to the transaction up front via a smart contract and with confidence in settlement due to the atomic settlement functionality, it means the **transaction could reach the beneficiary in a reduced time**. This in turn could lead to reduced costs for consumers, businesses, and banks due to less time being spent by the multiple parties in the chain.

ii. Reduced FX risk: Due to the ability to agree transactions end-to-end before execution and increased speed of the transaction, participants in a chain may be able to price FX rates at the point of execution (intraday and near real-time). This could help firms reduce FX risk and is something that we would need further exploration/testing in a later phase.

iii. Improved settlement times and 24/7 liquidity: The atomic settlement functionality RLN can provide could help reduce settlement times, which are currently T+2 for some currencies. Having the ability to settle 24/7 could unlock liquidity efficiencies for commercial banks from reduced funding and overnight borrowing costs and from reduced overall regulatory capital requirements for end-of-day balances and intraday credit. However, there are operational considerations due to these changes.

iv. Simplification of process: RLN has the potential to simplify the process for crossborder payments by initiating the smart contract and coordinating the movement of money. By having a node on the RLN, all the parties involved in the transaction can participate in this streamlined process. For cross-border payments, it could reduce the amount of time spent on payment exceptions and investigations, as issues could be identified prior to the transaction being orchestrated.

4.2.2   Feasibility assessment

This use case is more complicated to carry out as a PoC based on the complexity of the international focus and regulation, as well as the participation of commercial banks and central banks from multiple jurisdictions. **The Swiss National Bank recently announced they will be launching a digital currency pilot**. In addition, the BIS have published a blueprint for the future monetary system that referred to the concept of a 'unified ledger' stating "The full benefits of tokenisation could be harnessed in a unified ledger due to the settlement finality that comes from central bank money residing in the same venue as other claims."

4.2.3   Use case 2 journey mapping - illustrative

- A UK based business (Company A) initiates a multi-currency (GBP to USD) cross-border payment via its bank's online banking platform. FX rate and any fees are agreed at this point.

- All parties agree to the transaction prior to the transaction being orchestrated by RLN (these include the Company A, Company A's bank, a correspondent bank, a US based supplier (Company B), and Company B's bank).

- RLN orchestrates atomic settlement, which includes the following steps:

    – Company A's bank burns GBP tokens.

    – Company B's bank mints USD tokens.

    – Correspondent bank mints respective GBP tokens and burn USD tokens to support the completion of the transaction.

- The correspondent banks' central bank partitions on RLN reflects the change in commercial bank liabilities.

- The US based supplier is (Company B) credited with the full USD amount.

- For the purposes of this flow, it is assumed that sanction screening and other compliance checks will likely be carried out by each of the banks (although in the future this could be via a shared utility).

4.2.4   Example of a wholesale - cross-border payment (multi-currency)
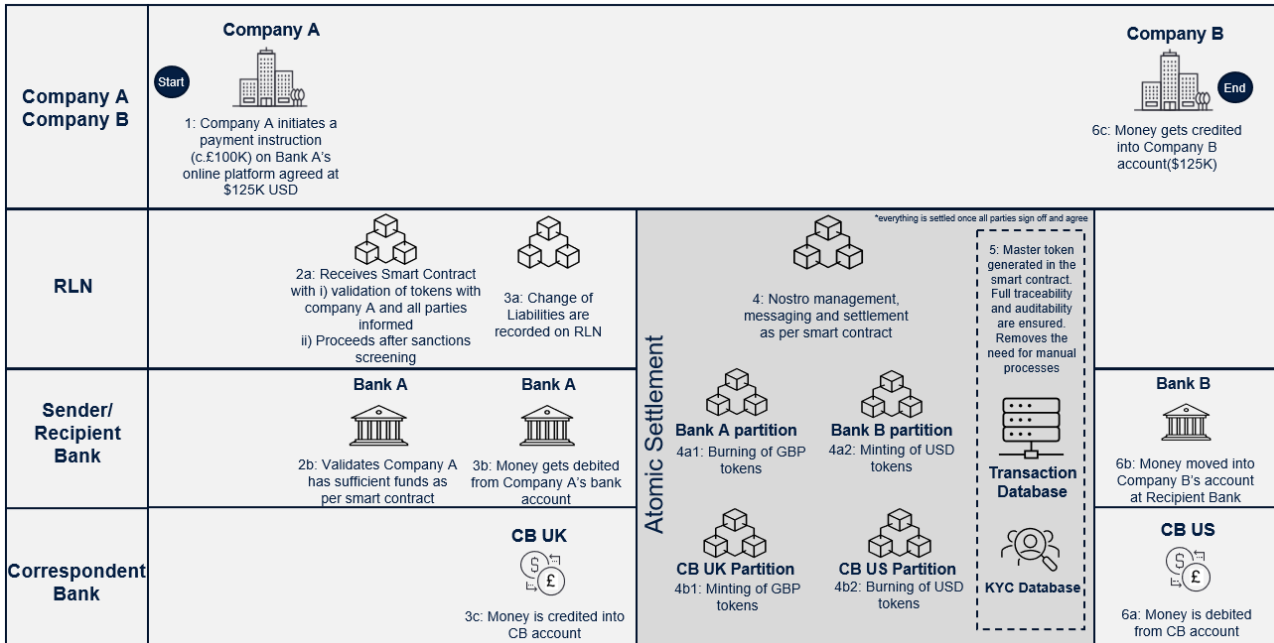
Key

Bank A = Sender's bank

Bank B = Recipient's bank

CB – Correspondent bank

4.3   USE CASE 3: WHOLESALE – SECURITIES SETTLEMENT (REPURCHASE AGREEMENT)

4.3.1   Benefits

The global market size of repurchase agreements (repos) **is valued at $16 trillion, with a daily turnover ranging from £2-4 trillion**.

This use case explored a bilateral cleared repo transaction between two corporates, with a commitment to buying back securities at a pre-agreed future date at a pre-agreed price. RLN would oversee the execution and settlement of the transaction but would not be a trading facility. In this case, the orchestration and programmability functions that RLN offers, could provide the following benefits:

     i)   **24/7 Liquidity**

     ii)   **Settlement efficiency**

     iii)   **Simplification of process**

     iv)   **Automated margining**

24/7 Liquidity: The use case could enable 24/7 availability and settlement windows, which would potentially enable 24/7 access to liquidity for both buy and sell-side firms. This could open intra-day repo markets, as well as other securities transactions, help firms manage low points and reduce the need for buffers. For example, firms may be able to improve operational efficiency and reduce uninvested cash or unfunded securities positions at the end of the traditional settlement window.

Settlement efficiency: Settlement benefits for this use case could be maximised due to high-frequency multi-party and multi-asset settlements. Settling cash and assets atomically together has the potential to enhance the settlement process. There could even be a potential in certain repo transactions to position assets before a trade can be entered into the application, which could help mitigate and/or eliminate settlement failures.

Simplification of process: RLN has the potential to simplify the process by programming various steps into the smart contract and coordinating the movement of money. By having a node on the RLN, other financial institutions (such as trading venues, clearing houses and Central Securities Depository's (CSDs)) can participate in this streamlined process. For the repo use case, by consolidating all flows onto a unified platform, RLN enables efficient netting and simplifies the settlement of diverse securities.

Automated margining: There is potential to greatly enhance the margining process by automating various steps (especially for non-centrally cleared trades) via the smart contracts, such as pricing the difference between the market value of the security used as collateral and the value of the loan across a range of factors (length of repo agreement, quality of collateral, credit quality of the counterparty, etc.). This could result in a higher-frequency margining system.

4.3.2   Feasibility assessment

The securities settlement has a medium degree of feasibility to carry out this use case as a PoC. This is due to the multi-asset focus, which means multiple non-bank parties would be involved (e.g. CSDs), as well as potential additional regulatory complexity. However, it is worth noting the other participants are regulated financial institutions.

4.3.3   Use case 3 journey mapping - illustrative

- Once Corporate A has initiated a repurchase agreement with Corporate B and the trade has been agreed on the venue, RLN would receive the instructions to oversee the coordination between all relevant financial intuitions involved in the transaction and the orchestration of the settlement for both the near and far legs.

- The custodians are part of the RLN network and settle with each other.

  - Custodian A is the agent for Corporate A and has a partition on the RLN, holding a securities wallet (tokens) and cash wallet (tokens).

  - Custodian B is the agent for Corporate B and has a partition on the RLN, holding a securities wallet (tokens) and a cash wallet (tokens).

  - The interactions between Custodian A and Custodian B may include, but are not limited to execution, confirmation, terminations, term changes, and netting.

- The securities settlement and transfer of the record of ownership is done via the Central Securities Deposit's partition on the RLN.

- The cash settlement is done via the Central Bank's partition with wholesale CBDC (wCBDC) on the RLN.

- It is assumed that margin calls are made by the buying party between T0 and T+n (near and far legs). An automated default close-out process is initiated if necessary.

- It is also assumed that all near leg activities happen at the same time, which transfers the ownership of the securities, while the far leg activities occur after n days.

4.3.4   Example of Securities Settlement Use Case Flow
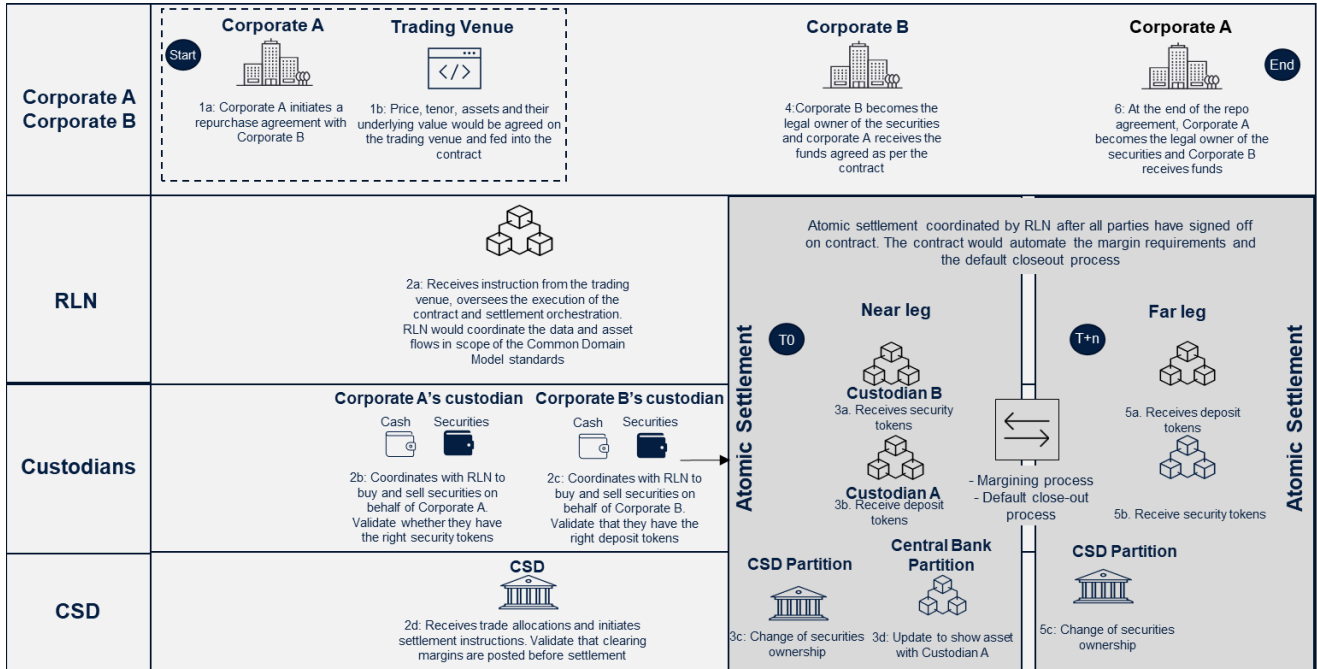
4.3.5   Example of RLN Partitions for Securities Settlement Use Case Flow
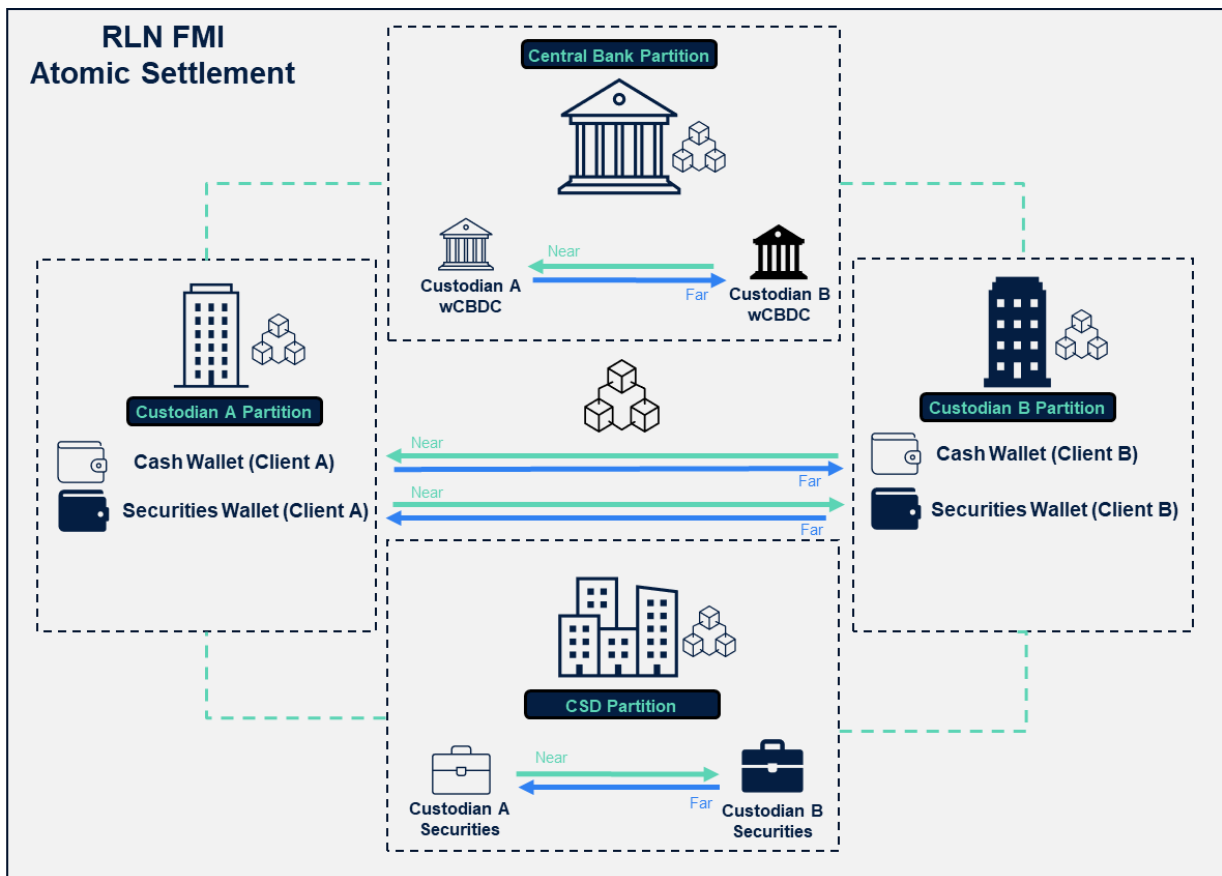
5. REGULATORY FINDINGS AND CONSIDERATIONS

During the Discovery Phase, the regulatory workstream explored a set of fundamental questions and regulatory considerations that applied generally to the RLN concept and specifically in relation to each of the three use cases.

The aims of the workstream were to both help baseline the regulatory aspects that required further assessment in the Experimentation Phase and to understand the potential regulatory complexity and shift required, if RLN were to move beyond a PoC and into live implementation.

The report contains only high-level preliminary outlines of some of the key regulatory factors for RLN and is not a comprehensive review. For example, at the next phase of work, further analysis would need to include considerations on the impact of wider financial services laws, such as the Financial Services and Markets Act (FSMA), property and competition laws. Please note these comments do not indicate a legal opinion, instead they are for discussion and consideration only.

The Experimentation Phase of RLN would benefit from a legal opinion on the below issues and engagement with UK policymakers, including but not limited to the BoE and HM Treasury (HMT). It may also be that a securities settlement PoC could potentially be tested via the Digital Securities Sandbox.

5.1   FMI CLASSIFICATION

In respect of whether the RLN would benefit from finality of settlement under the relevant regulations (**Directive 98/26/EC** has been implemented in UK law in the form of the **Financial Markets and Insolvency (Settlement Finality) Regulations 1999**), there are certain FMIs that are automatically deemed to satisfy the requirements for having finality of settlement e.g. a recognised clearing house.

Therefore, the regulatory work during the Discovery Phase explored if RLN could be considered a FMI. **It is likely that RLN would satisfy the definition of a FMI**, since it would operate a shared ledger that records, transfers, and settles payments and/or securities transactions. As such, it would need to comply with relevant legislation relating to the registration and operation of an FMI in each jurisdiction it operates in. This would require making an application to regulatory authorities and obtaining approval, in order to conduct its activities.

The type of FMI that RLN could be considered as was explored across the three use cases, as part of the Discovery Phase

1.   **Consumer domestic payment:** RLN could potentially be considered as a "*payments system*" under **s182 of the Banking Act 2009**

2.   **Wholesale cross-border payment:** RLN could potentially be considered as a "*payments system*" under s182 of the Banking Act 2009

3.   **Securities settlement (repo):** Less clear what category RLN would be as this would depend on the design and specific functions.

With the securities settlement use case, the classification would depend on the design and specific functions of the RLN, in the context of the repo transaction. In particular, the regulatory classification would differ if RLN does any (or a combination) of the messaging, orchestration or settlement (of either or both cash and securities) activities in the transaction, as well as if securities are issued directly onto RLN and/or how the record of ownership is treated if there is a CSD partition on the network.

The Discovery Phase explored a range of technology architectures and options for RLN, including distributed ledger technology (DLT), which would be applicable across all use cases. Current FMI rules will likely require additional guidance to enhance regulatory clarity as to what additional regulatory milestones or information the regulatory authorities would require, in order to monitor the operation of RLN if it uses DLT/ blockchain technology.

Therefore, it would be helpful to conduct further analysis, as well as engage with HMT and the BoE in the Experimentation Phase. Specifically, to better understand how RLN operations would fall within the FMI regime and what impact the combination of use cases, as well as different technologies, would mean in respect of the regulatory authorities' views of what type of FMI RLN would be considered.

5.2   TOKENISATION OF COMMERCIAL BANK LIABILITIES

The Discovery Phase work also explored the potential legal status of tokenised commercial bank liabilities on the RLN. The potential legal status may differ in different jurisdictions. For the purpose of this work, it's important to understand how RLN tokens would be considered in the UK. This includes:

- E-money: It is unlikely that RLN tokens would be considered e-money, since the tokens would not be accepted by a person other than the issuer.

- Stablecoins (e.g. fiat-backed): It is unlikely that RLN tokens (or commercial bank liability tokens) would be classified as stablecoins according to the current definition.

- Financial instruments (e.g. deposits[1]): It is more likely that the RLN commercial bank liability tokens would be viewed as forming part of a payment.

5.3   SETTLEMENT FINALITY

After exploring if RLN could be considered an FMI and the potential legal status of RLN tokens, the Discovery Phase examined if RLN could potentially apply to HMT to be both a recognised "*payments system*" and "*designated system*", which would mean it could benefit from settlement finality.

Under the current regulations, any corporate (such as a payments system) can apply to HMT to be a "*designated system*" under the relevant regulations that would benefit from settlement finality.

- The requirements for being a "*designated system*" were also discussed e.g. there must be at least 3 institutions participating in the system; and the system must have rules etc.

- Crucially, it was noted that a "*designated system*" could not be an arrangement entered into by two interoperable systems.

- While there is no definition of "*an arrangement*" in the regulations, provided that the designated system meets the definition of a "*system*" in the regulations, then this should be sufficient.

These points would need to be clarified in the Experimentation Phase and we would benefit from engagement with UK policymakers, including but not limited to the BoE and HMT.

To achieve settlement finality, the Discovery Phase also explored what would happen if RLN participants used different settlement assets for a transaction and the equivalence of those assets. These included:

- Wholesale CBDC that would be issued onto the RLN, including from other jurisdictions for cross-border transactions.

- Application Programming Interface (API) calls to existing RTGS reserve accounts.

- Additional settlement assets (e.g. Fnality or other systems that use the Omnibus Account).

The use of different settlement assets raises key considerations such as, do both parties in a transaction need to use or accept the same settlement asset? Alternatively, can parties use different settlement assets (e.g. one firm uses wCBDC and another uses Fnality)?

One of the key considerations is the claim that wCBDCs and RTGS reserve accounts represent a direct claim on the central bank. This legal status might differ for other settlement assets. For example, settlement assets which rely upon claims on funds held in the **BoE Omnibus Accounts**. These accounts are held by a payment system operator and house co-mingled funds that belong to different entities. These may not therefore represent a direct claim on the central bank. This could raise additional challenges that would be helpful to examine further in the Experimentation Phase.

The Discovery Phase explored if the use of other settlement assets (e.g. Fnality) on RLN would potentially change the rights and characteristics of that asset itself or not. It seems unlikely that there would be changes to the rights, but this would need to be explored further in the

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1   **The Law Commission** concluded in it's 2022 report on Digital Assets that "that the characterisation of an asset that by itself satisfies the definition of a financial instrument will be unaffected by that asset being merely recorded or registered by a crypto-token within a blockchain- or DLT-based system".

Experimentation Phase and subject to further clarification on the precise legal arrangements for RLN and other settlement assets.

The thinking was that RLN could use wCBDC and RTGS for the central bank settlement process and achieve settlement finality. However, the Experimentation Phase should explore and test the practical implications of using of API calls to RTGS reserve accounts, wCBDC and other settlement assets.

5.4   OUTSOURCING

There are exemptions under the **Prudential Regulation Authority** (PRA) and **European Banking Authority** (EBA) outsourcing arrangements for settlement and use of global finance infrastructure (e.g. FMIs). However, if RLN were to provide additional activities above the core FMI activities (e.g. clearing or settlement) those may be considered "outsourcing" and/or "material outsourcing", which may trigger additional relevant regulatory requirements. This would need to be analysed further in an Experimentation Phase.

5.5   KNOW-YOUR-CUSTOMER (KYC), ANTI-MONEY LAUNDERING (AML), AND SANCTIONS SCREENING

Regarding the potential enhancements to KYC, AML, and sanctions screening, there is a reliance provision for standard due diligence under the **UK Money Laundering Regulations 2017**. This means that Bank A could potentially rely on the standard due diligence checks completed by Bank B for a transaction in RLN, subject to compliance with the relevant requirements.

This could potentially be facilitated (both bilaterally and multilaterally) if the RLN (as an FMI) has a rulebook, which all RLN participants sign-up to and which stipulates that all participants adhere to the requisite standard of AML (based on the relevant jurisdiction regulation/legislation), provided that these arrangements can be considered to be compliant with the conditions of the reliance provision. Theoretically, smart contracts could be used to help show adherence to the rulebook and relevant AML and due diligence checks.

Banks are not able to rely on the enhanced due diligence checks of another firm under the UK Money Laundering Regulations 2017. However, it was discussed that firms may outsource enhanced due diligence checks to a third party, which could be another firm. This is an area that would benefit from further analysis during a PoC.

Similarly, there is no reliance provision in the UK financial sanctions regime. However, firms may outsource screening and/or other financial sanctions compliance processes to a third party (but will remain fully responsible for discharging all their regulatory obligations). This means that Bank A could potentially use the sanctions screening of Bank B for a transaction in RLN, if there is service level agreement for sanctions screening and sanctions compliance processes in place between the banks (subject to the relevant outsourcing requirements, if applicable). However, liability for breach of sanctions would still lie with each bank.

Conceptual ideas for how all RLN participants could rely on enhanced due diligence and sanctions screening completed by any participant were discussed. A proposed solution was that these **checks could potentially be outsourced between all participants within the RLN**, either bilaterally or multilaterally. Some of the proposed solutions included the implementation of a multilateral outsourcing agreement, which would form part of the RLN rulebook that participants could enter into/agree to abide by. These would be concepts to test across all workstreams in the Experimentation Phase.

The Discovery Phase also explored the challenges around the liability for any failures when relying on or using outsourced enhanced due diligence sanctions screening. Again, this is an area that would benefit from further work in an Experimentation Phase. Some of the proposed solutions also included a scenario where **multiple participants involved in a transaction could validate the enhanced due diligence/sanctions screening checks**, in order to encourage reliance. It was noted that this could also result in liability for multiple participants. It was agreed that this was an important point to explore further in an experimentation phase.

# 6. TECHNOLOGY FINDINGS AND CONSIDERATIONS

The technology workstream completed the following:

- Identified technical RLN architecture options

- Outlined the technology approach

- Defined the RLN core technical features

- Compared capabilities for decentralised (DLT) versus centralised (non-DLT) infrastructure

- Comparative analysis of the relevant shortlisted technical platforms

There are five architectural options of significance.

Option	Description
0	Transaction orchestration & programmability layer
1-A	Covering the wholesale payment use case and Option 1-B covering the retail payments use case.
1-B	Commercial bank retail partition on the network with API integrating external platforms
2	Defines the possibility of having commercial bank partitions and central bank wholesale partitions on the RLN network while the Central Bank Ledger (Retail) sits outside the RLN network and is accessed via core ledger API's.
3	Defines the possibility of having commercial bank partitions and central bank wholesale and retail partitions on the RLN network.
4	Extension of option 3 where the CSD can explore the issuance of their assets on RLN as a ledger

- **Option 0:** RLN can play the role of orchestration and programmability without necessarily having shared partitions on the network. This architecture choice focuses on the role the RLN network performs during transaction orchestration. Network participants stay outside the RLN network & do not host nodes on the RLN network. The RLN network provides the option to connect with commercial banking systems, BoE (Retail & Wholesale), Omnibus Account, CDS / FMI / Exchange, Payment Interface Providers & KYC systems through their native rest APIs.

- **Option 1:** Defines the possibility of having commercial bank partitions on the RLN network while the Central Bank Ledger (Wholesale & Retail) sits outside RLN network and is accessed via API's. This option is architecturally significant as it involves settling in RLN tokens on the network. Option 1 is further detailed as **Option 1-A** covering a retail payment use case and **Option 1-B** covering the wholesale payments use case. Both would differ on the transaction throughput and volume making the underlying platform choices different.

- **Option 2:** Defines the possibility of having commercial bank partitions and central bank wholesale partitions on the RLN network while the Central Bank Ledger (Retail) sits outside the RLN network and is accessed via core ledger API's.

- **Option 3:** Defines the possibility of having commercial bank partitions and central bank wholesale partitions on the RLN network, while the Central Bank Ledger (Retail) sits outside the RLN network and is accessed via core ledger API's.

- **Option 4:** This is where commercial bank, central bank retail and wholesale and CSD partitions are on the ledger, and it can be extended to CSD issuing assets on RLN.
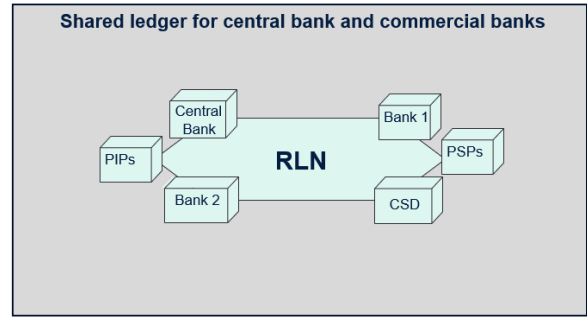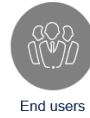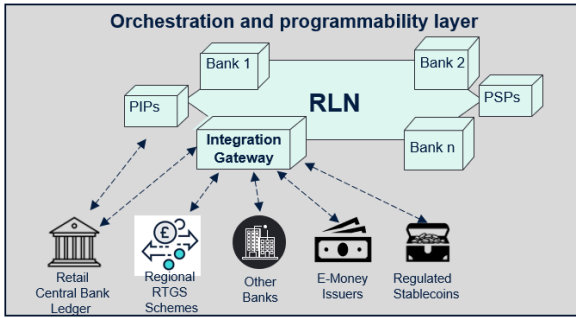
The Discovery Phase also produced a comparative analysis of the five architecture options across key functional parameters. These included: the need for partitions, settlement avenue, use case coverage, locking/unlocking, synchronisation, and more, which helped give a summary view of key attributes for application of each architecture.

Analysis was carried out on whether decentralised or centralised infrastructures are more architecturally viable. The analysis revealed that decentralised technology has significant advantages that RLN can benefit from, particularly on the tokenisation theory, integrity, transparency, and privacy. The Discovery Phase technology work also focused on a comparative analysis of the technical platforms that could best fit RLN architecturally. After initial research, the analysis was validated by an information gathering exercise with key technology platforms. These included: Corda (R3), Adhara, Millicent, Quant, Polygon, Canton (Digital Asset), Setl and Knox. There was also a detailed analysis on Quorum, Parity and Hyperledger Besu.

Nature/Feature		Option 0	Option 1-A	Option 1-B	Option 2	Option 3	Option 4
		Transaction orchestration & programmability layer	Commercial bank wholesale partition on the network with API integrating external platforms	Commercial bank retail partition on the network API integration external platforms	Commercial bank partitions and Central bank's wholesale partition on the shared ledger and integration with Central bank retail CBDC via core ledger API	Central bank wholesale and retail partitions and Commercial bank partitions on the shared ledger	Central bank wholesale and retail partitions, Commercial bank partitions, and other assets' partitions (e.g securities) on the shared ledger
RLN partitions adoption	Commercial bank partitions	No	Yes	Yes	Yes	Yes	Yes
	Central bank partition for wholesale money	No	No	No	Yes	Yes	Yes
	CSD partition for securities	No	No	No	Yes	Yes	Yes
	Central bank partition for retail money	No	No	No	No	Yes	Yes
Settlement mechanism (API or Shared ledger)	Commercial bank's wholesale money	API	Shared ledger	API	Shared ledger	Shared ledger	Shared ledger
	Securities	API	API	API	Shared ledger	Shared ledger	Shared ledger
	Commercial bank's retail money	API	API	Shared ledger	API	Shared ledger	Shared ledger
Locking on funds	Locking on commercial bank's retail money (for simple payment, PvP, DvP, etc)	Yes (Commercial banks decide either in RLN or open banking API)	As per Option 0	Yes	As per Option 0	As per Option 0	As per Option 0
	Locking on commercial bank's retail money	Yes (Central bank to decide either in RLN or Core ledger)	As per Option 0	As per Option 0	As per Option 0	As per Option 0	As per Option 0
	Locking on commercial bank's wholesale money	No	Yes	No	Yes	Yes	Yes
	Locking on central bank's wholesale money	No	No (Sync operator RTGS renewal dependency)	No (Sync operator RTGS renewal dependency	Yes	Yes	Yes

The technology work concluded that while having a network with shared partitions is preferred, **Option 0 and Option 1-B architectures may be the first step** towards an MVP implementation in the PoC stage whereby other architectural considerations can be incrementally added. Exploring options with a shared ledger environment could yield more value, drive efficiency, and reduce risks. The key consideration should be to choose a platform that can scale up to significant retail transaction volumes, while providing an ability to cover wholesale use cases as well.

Additional key considerations for the Experimentation Phase, which would need exploring, include:

- Requirement of wallets and sub-wallets.

- Offline payments (across all forms of money).

- Requirement for RLN to make payments from one form of money to another.

- Rosalind APIs on RLN ledger.

- Liquidity saving mechanisms and netting demonstrated by shared ledger (DLT).

- Identifying key technology primitives and mapping of use cases to primitives for value realisation.

7. CONCLUSION

The Discovery Phase met its objectives through the business, technology, and regulatory analysis and deliverables, so that the participants have the information needed to enable them to make an informed decision on whether to take part in any subsequent Experimentation Phase.

Workstream	Deliverables
Business	Documented use case flows to understand the business implications, benefit, and feasability for a PoC
	Listed core hypothesis that could be tested in a PoC
Regulatory	Examined regulatory and legal considerations
Technology	Identified and explored the technology architectures options

- **Sequential journey** - the Experimentation Phase for RLN in the UK could be a sequential journey, which includes PoCs for all three use cases over a period.
- **Infrastructure and architecture** - Five different architectures have been identified that could deliver RLN. These range from orchestration through to all parties having a partition on the network, which means the concept can be scaled and expanded in a journey as confidence increases. The architecture should be designed so it can be extended to all use cases. This would truly test the viability of the RLN concept.
- **Prioritisation** - recognising current industry priorities to support the singleness of GBP while providing better controls to UK consumers at risk of APP purchase scams mean that the **consumer domestic payment** is the recommended use case for the first PoC:
    - It aligns with the priority of ensuring the continued singleness of money, providing a platform where commercial bank and central bank liabilities co-exist with similar functionality.
    - Enables participants to explore how RLN may help reduce APP fraud, driving significant business benefits for consumers, businesses, and financial institutions in the UK.
    - It could also potentially test if upgraded commercial bank money and RLN can provide a more effective platform for innovation.
    - Ensure the RLN infrastructure is designed with a high throughput capacity and resilience from the outset, rather than having to amend it later.
    - It has the lowest potential regulatory complexity.

These findings emphasise the importance of taking forward the RLN concept into the Experimentation Phase, with the consumer domestic payment as a first PoC. Continued public-private engagement and sharing of information is core to the Experimentation Phase being of value to UK society. The PoC could help prove/disprove the core hypotheses, demonstrate the benefits conceptualised during the Discovery Phase, and enable industry (including regulators) to identify and prioritise investment in the infrastructure that best delivers future-proof innovation to help the UK prosper.

As a next step, the participants should now scope and plan an Experimentation Phase.