LCPDelta

Northern Ireland Smart Electricity Metering Design Plan

Prepared for: **Department for the Economy**

V3.0

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LCP Delta is a leading European research and consultancy company providing insight into the energy transition. Our focussed research services include Connected Home, Electrification of Heat, Electric Vehicles, New Energy Business Models, Digital Customer Engagement and Local Energy Systems. We also provide consultancy for clients including networking companies and policymakers. LCP Delta mission is to help our clients successfully navigate the change from 'old energy' to new energy.

Contents

1. Executive summary

1.1. Background and vision

The energy system is digitalising and becoming more dynamic. More energy tariffs and services are being offered to customers, which will help them to decarbonise, become more engaged in the energy system and use energy more efficiently. Smart meters are an essential enabler of this.

The benefits of smart meters include for example[1]:

- Accurate billing – smart meters send automatic meter readings to the consumer's energy supplier.
- Real-time usage data – with an in-home display or smartphone app a consumer can monitor their energy consumption to help them understand and manage their energy usage and costs. This can help the consumer to be more energy aware.
- Innovative smart tariffs – consumers can take advantage of innovative tariffs, where available, by adapting their behaviour and using energy away from peak times or when there is excess clean electricity available.
- Improved network operations – engineers will know much faster when power cuts have occurred and will have better information about the cause. This will enable them to conduct quicker and cheaper repairs and reduce the risk of similar problems occurring in the future.

Northern Ireland's Department for the Economy (DfE) oversees the region's energy policy. In the latter part of 2021, the Minister introduced 'The Path to Net Zero Energy'. This strategy document highlights smart meters as pivotal in fostering a modern, digital energy system that not only benefits consumers through providing valuable data but also enhances overall system efficiency.

In the following year, the DfE commissioned a Cost-Benefit Analysis (CBA) for both electricity and gas smart meters, which affirmed the economic viability of deploying electricity smart meters. The 2024 Energy Strategy Action Plan subsequently outlined an action to finalise a comprehensive plan for the implementation of these meters, setting the stage for consumer roll-out.

The purpose of this piece of work is to undertake an evaluation of smart meter implementation strategies employed elsewhere to understand the key risks and challenges (in areas such as data protection, customer engagement and consumer protection), as well as to gather established best practices. The recommendations and plan formed after this research and analysis and documented here will inform a design plan consultation and guide the forthcoming deployment of smart meters in Northern Ireland, ensuring it is adapted to the unique requisites of the local electricity market and its consumers.

[1] https://www.gov.uk/guidance/smart-meters-how-they-work#smart-meter-benefits

1.2. Risks for the Northern Ireland market deployment

This report has highlighted key risks associated with the Northern Ireland smart meter rollout:

- **Consumer resistance** to getting a smart meter would delay the implementation, increasing costs and reducing the effectiveness and benefit of the rollout. This needs to be mitigated against by understanding the barriers through early stakeholder engagement and ensuring a consumer-centric approach (rather than treating this as an infrastructure project). A specific example is the need to ensure that the functionality of smart meters meets the needs of the prepayment market.
- There is a risk that the value that can be captured by and for customers could be limited **if data access is too restricted**. However, **consumers need to be adequately protected** too.
- We identified several risks associated with data management, including a **perceived loss of control over data privacy and pricing,** and also the **risk of data breaches and cyber security threats**, which would compromise consumer trust and delay implementation.
- The need to reduce the risk of technical issues arising, for example by **minimising the implemented permutations of suppliers and technology** in order to reduce complexity and cost of rollout.

1.3. Recommendations

Below, we summarise our key recommendations, grouped around key themes, on moving forward with the Northern Ireland smart meter roll out.

The recommendations are based on our analysis of the evidence gathered through the literature review and stakeholder engagement, and consideration of the various options available for moving forward.

The literature review was conducted across a range of relevant publications, and we considered the whole of Europe at a high level and then undertook a more thorough review of Great Britain, the Republic of Ireland and Italy. These reviews built a foundation of existing knowledge, and identified current research gaps, to understand the complexities of smart meter rollouts.

This report also incorporates insights and feedback from a series of stakeholder engagement workshops, which brought together a diverse group of participants from various involved organisations across government and industry.

1.3.1. Roles and responsibilities

Establishing clear roles and responsibilities for industry, government, and the utility regulator is critical to consider at the early stages of the smart meter rollout in Northern Ireland. Identifying and assigning these roles:

- clarifies the responsibilities and expectations for each stakeholder, reducing confusion and enhancing accountability throughout the rollout process

- ensures that all aspects of the rollout are clearly assigned to and managed by the appropriate parties, thereby streamlining operations, and improving the overall effectiveness of the initiative
- fosters cooperation and coordination among stakeholders, which are crucial for overcoming challenges of the smart meter rollout for consumers and the electricity system in Northern Ireland.

We recommend the following high-level roles for key bodies, caveating that the details need to be discussed and agreed with the organisations suggested:

Organisation	Role
Government, mainly DfE	• Lead a **programme steering board** to cover overall programme governance (with regulator) • **Initial announcement** of roll-out and objectives • **Further analysis** and research into several recommended areas, e.g. cybersecurity, remote switching & disconnection • Building Regulation changes (if necessary), by Department of Finance
Network	**Lead roll-out** • Roll-out **strategy and planning** • **Meter and system procurement, meter installation** • Programme management, operations and planning • Regulatory revisions (jointly with UR) • **Data management** (along with UR & suppliers), especially assuring that data is open by default (ensuring that artificial barriers to data provision are limited, but that consumers are protected in the process)
Regulator	• Consumer protection (with support from Consumer Council) • Regulatory revisions (jointly with Network) • Regulatory oversight of roll-out strategy, programme management and consumer engagement • Monitoring delivery of benefits
Consumer council (& another?)	• Consumer protection (supporting the Regulator) • Consumer engagement (public awareness campaign), jointly with other parties • **Consumer perspective** in programme management and governance
Suppliers	• Communicating benefits of smart meters • **Developing smart propositions** • Benefits delivery

1.3.2. Consumer Protection

Ensuring that consumer rights and needs are safeguarded is essential for the project's success through widespread trust and adoption. Consumer protection principles and arrangements should be governed by the Utility Regulator with the support of the Consumer Council.

We recommend that:

- DfE should complete further work to outline how **remote switching functionalities and disconnections** are considered.
- **Time of Use (ToU) tariffs** are in place and are a competitive option for consumers. There should be clear outcomes for ToU tariffs, such as making electricity cheaper and greener.
- Consumers should be **able to access near-real-time data**, to encourage savings and behaviour change.
- **Occasionally consumers may not be able to receive a smart meter**, for example where comms connectivity is an issue due to a remote or rural location or where the meter is inaccessible. This needs to be acknowledged and considered in the plan.
- The smart meter rollout in Northern Ireland needs to **keep consumers at the core** of the project and should not become merely an infrastructure project.
- **Clear protocols around the installation of smart meters should be established** to ensure a successful roll-out for both consumers and installers. These should cover subjects such as how properties are to be accessed and how to identify vulnerable consumers and then refer these people to appropriate support services.

1.3.3. Data

Good data management considers areas such as data flow, data protection/privacy requirements, and cyber security risks and measures. Our recommendations for data management include:

- An **"open by default"[2] approach** to energy data should be taken, ensuring that data is suitably anonymised or aggregated and therefore avoiding compromising the privacy of any individual's personal data . This will encourage innovation, ensure industry parties do not artificially constrain the use of data across the wider market, and enable the benefits of smart meters to be maximised such as consumers using near real-time data to change habits.
- **Consumers should have a simple mechanism to provide consent to access to their data** from smart meters. This would improve and streamline the ability to switch suppliers, enable third parties to offer services such as switching advice, support demand response programmes, or provide other energy services such as personal energy / decarbonisation advice.
- The Northern Ireland smart meter rollout should **follow existing good practice on consumer consent.** Open banking is a good example of a simple system which always gains consumer consent to enable a third party to access data.

[2] Section 5.5: Recommendations provides a high level overview of the concept of "open by default" and some example 'public interest' use cases where benefits are possible by making aggregated or anonymised data available, which would not compromise any individual's privacy.

- Smart meters and **the processing of smart meter data must comply with data protection principles set out under the UK GDPR. DfE should assess whether existing data protection regulations (e.g. GDPR) are sufficient.** Due to the levels of concern around access to and use of data early in the GB rollout, additional rules beyond GDPR were added around smart metering data usage / access, which made it overly complicated.
- A **clear assessment of what constitutes personal data** would be beneficial. For example, in GB an initial decision that an MPAN was considered personal data, even though it is the same as a random address and you are unable to assign it to a person, the industry still has confusion about which data is personal.
- **DfE should assess how to make available anonymised smart meter data.** This has been a key challenge in the Republic of Ireland and GB rollouts.
- A **thin smart meter infrastructure solution** appears to be a stronger solution for Northern Ireland due to a centralised data system and a simpler, cheaper, and quicker to change structure. However, further analysis is required to ensure that a thin smart meter solution can support keypad customers given how keypad currently works in Northern Ireland.
- **Further consideration needs to be given to cyber security aspects** beyond this design. Research should include details on the mechanisms that should be deployed to ensure data and the network are sufficiently protected from cyber attacks, data leaks and energy security events such as blackouts.

1.3.4. Functional and technical requirements

Understanding and meeting minimum functional and technical requirements is essential for ensuring the project's success. Reliable performance and user satisfaction through the correct level of design and functionality is key.

Our recommendations on the functional and technical requirements of a NI smart meter roll-out include:

- **Using tried and tested, off the shelf meters and systems, rather than a bespoke solution.** Designing bespoke systems and meters, the cost of which would have to be recovered from the small population base of the Northern Ireland roll-out (or through non-smart metering mechanism) would put the delivery of the CBA at risk.
- **Meter and system requirements should be developed to ensure that the benefits identified in the CBA can be delivered** but they may need to be refined to de-risk the roll-out to enable selection of proven solutions, in line with the above recommendation.
- **Remote disablement needs to be carefully considered in the rollout plan.** The cost benefit from introducing this functionality must be considered if the number of disconnections is extremely low in Northern Ireland since it may be more efficient to send out an engineer to disconnect meters.
- Northern Ireland has a high proportion of prepay customers and **DfE must ensure smart meters are at least as smart as existing prepay solutions** to ensure that consumers are willing to replace existing meters.
- We recommend **designing in proper network management and message prioritisation** to the central systems which does not create a central system where

everyone has to work their business processes around. This creates significant challenges with system operation due to the high level of traffic through the system.

- **As few suppliers / technology permutations should be introduced as possible** in the Northern Ireland rollout. Increasing the number of combinations will increase the complexity of the rollout and introduce additional expense and, as seen in GB, presents a greater risk of high volumes of meters not working.
- **DfE may wish to consider the inclusion of in-home displays (IHDs) in the technical requirements of smart meters.** IHDs add cost to the meters and there is often a low level of usage, although Citizens Advice have reported an uptake in usage in Great Britain over recent years. If a solution is presented without an IHD, there is a greater need for consumer apps to display the same information.
- There are several possible means for communication that should be considered and at a high level there is not enough information to recommend one form of communication over the others. **DfE should consider the form of communication further for the technical and functional requirements.**
- Stakeholder engagement highlighted that telecommunications copper will be replaced by fibre technology. This could increase efficiencies of the rollout by ensuring the rollout works off the back of the fibre rollout with both rollouts accessing properties at the same time. This may reduce the rollout cost and it will reduce the disruption to the consumer if access to properties is completed with the fibre installation. Stakeholders commented that based on the high fibre rollout in NI it looked like an attractive option for the communications. **Northern Ireland Energy Networks (NIEN) should engage meter manufacturers and telecommunications companies** to work out what form of communication it should consider for the rollout.
- **A user-friendly interface**, whether via an in-home display (IHD) or a mobile app, **is essential** for smart meter functionality. This ensures consumers can easily read and interpret their energy usage data, promoting better understanding and engagement with their energy consumption, and maximisation of benefits.
- **A thin smart meter infrastructure solution appears to be a stronger solution** for Northern Ireland due to a centralised data system and a simpler, cheaper, and quicker to change structure. However, there was concern over a thin smart meter solution, particularly for keypad customers given how keypad currently works in Northern Ireland. Further research should be completed by DfE to investigate how a thin smart meter can address concerns with keypad customers.

1.3.5. Barriers to Consumer Buy-in

Addressing the barriers to gaining consumer buy-in for the smart meter rollout in Northern Ireland is critical to consider at the early stages of rollout design. Understanding and addressing these barriers are essential for ensuring the project's success through high levels of uptake.

Each recommendation is supported by the detailed analysis completed as part of this project to ensure there is a consumer focus that adequately addresses all concerns raised by various stakeholders. Our recommendations include:

- A **consumer-focussed rollout** is needed with **consumer trust** being a common issue that is encountered with metering rollouts. Highlighting the benefits to customers and who bears the cost of smart meters in a tailored, timely, and transparent approach is extremely important as this builds trust and understanding generally, and from priority

groups that have been identified. Further, the total cost of and anticipated completion level of installation will be significantly impacted by the effectiveness of any consumer engagement campaign.

- However, **it is important to not make any false promises from the outset** (such as smart meters will save £XX per year). These messages could destroy credibility of the rollout and increase the distrust from consumers, resulting in negative impacts on the uptake and costs of the rollout. Savings are dependent on consumer behaviour, appropriate tariffs, and other factors.
- To foster trust, an independent authority, like Smart Energy GB is therefore essential for providing impartial advice and ensuring clarity on benefits beyond just eliminating the estimated bills in Northern Ireland.
- We recommend that **the communication of benefits does not solely rest with suppliers**, but involves input from various stakeholders in a coordinated approach. In particular, we recommend that the following stakeholders have the following roles in a coordinated approach:
    - Government – initial announcement
    - Consumer Council – public awareness campaign
    - NIEN and suppliers communicate benefits – overseen by UR
    - For business customers a business representative organisation should be used to communicate with customers.
- We recommend developing a **proactive communication strategy to address potential negative press.** This may include engagement with media outlets to correct misinformation, highlight success stories, and demonstrate transparency. This approach will help maintain consumer confidence, trust, and uptake throughout the rollout.
- DfE should consider recognising the **social implications** of smart meter adoption, particularly among tech-savvy individuals, who can influence acceptance and engagement from consumers.
- The **customer engagement journey** is essential to get right. Considerations need to be made from initial contact through to installation / doorstep protocols and then long term customer engagement post installation.
- Customer engagement and installation process should minimise disruptions to the customer and **quick, easy and hassle free**, with smart tariffs and benefits available at the same time as install. There should be an ability to easily schedule installations and works must be adequately explained to the customer. DfE should consider how it provides a centralised resource for customer enquiries to **streamline this process.**
- Engagement highlighted the **disruption for installations is more significant for small businesses** compared to domestic consumers so a focus should be on communicating benefits to businesses and addressing their disruption concerns.
- **Avoid the use of an implied mandated rollout and hard targets** as this will disengage consumers.
- **Smart meter data (and therefore benefits) must be made available immediately post installation**, including digital app showing engaging data visualisation and actionable insights. This should include the ability for consumers to see their data and

energy saving information, as well as possess the ability to compare information to similar homes.

- **Ongoing support and advice are essential post-installation**. This will require support and advice on new smart-enable products and services, in addition to supporting consumers **to fix devices that have stopped working**. This can be done through a specific Helpdesk which includes the option to speak to someone, to receive advice.

1.3.6. Rollout Strategy

Having a robust rollout strategy for smart meter rollout offers numerous benefits that ensure the project's success and long-term sustainability. A well-planned strategy:

- minimises the risk of technical, logistical and cost challenges to ensure an efficient and timely implementation across Northern Ireland
- ensures that the technology works as intended from the moment of installation, therefore reducing the need for subsequent interventions
- enhances customer satisfaction by fostering trust and cooperation, both of which are crucial for overcoming resistance to widespread adoption.

Our recommendations include:

- **Adopting an 'opt-out' and 'active' approach** based on identified learnings and the strong preference for this as identified in the workshops. This approach aims to streamline the process for consumers while still respecting consumer autonomy. However, further research, with a particular focus on capturing customer views, is necessary to confirm this rollout strategy is best placed for Northern Ireland.
- **Careful consideration should be made to how the rollout strategy is communicated.** Reference to a 'mandatory' rollout strategy should be avoided, and it would be prudent to use language that is more likely to instil confidence in consumers.
- It is crucial to **outline the proposed timeline for the rollout** and list the main tasks for the pre-rollout planning, installation phase, and post-installation monitoring. A comprehensive plan **catering to different consumer segments** with a strong consumer focus should be devised when designing the rollout strategy. Moreover, geographical aspects must be carefully considered to optimise the rollout process and prioritise areas for initial implementation.
- **Sufficient milestones should be clearly outlined** to enable effective progress tracking. Additionally, consumer feedback must be actively solicited and incorporated into the rollout strategy to ensure its responsiveness and adaptability. This dynamic strategy will enhance the rollout's success and address emerging challenges proactively.
- **Further research, and in particular behavioural research,** is vital to identify key customer segments that should be prioritised in the rollout strategy. Additional research on the geography is also required to maximise efficiency of resource deployment and smart meter uptake.
- The rollout strategy must strongly **consider the availability of consumer benefits,** including those from ToU tariffs, during the implementation of smart meters. Ensuring the availability of all benefits is crucial to fostering consumer uptake and trust in the new technology. However, careful consideration must be given to the potential "chicken & egg" situation arising from energy suppliers requiring consumption data generated by

smart meters before being able to offer ToU tariffs. Balancing this dynamic is essential to effectively leveraging the benefits of ToU tariffs while addressing logistical challenges in their implementation.

- We recommend that **NIEN take the lead in both the rollout and roadmap development for the rollout strategy**. The roadmap should comprehensively address the needs of all stakeholders that have been identified as a priority, including system requirements stemming from grid constraints for example. The roadmap must ensure a fair and equitable transition, particularly for key groups in Northern Ireland (i.e., prepayment users).
- Additionally, **NIEN should establish a governance approach to effectively monitor the rollout process**, ensuring accountability and transparency throughout. This will also allow the network to quickly react to challenges as and when they arise during the rollout of smart meters. However, literature reviews and stakeholder engagement identified the need to not over-govern the rollout.
- **KPIs for the rollout monitoring should include a diverse range of measures beyond just installation quantities**, as observed in the ROI rollout. By incorporating various measures, including functionality and usability assessments, the effectiveness and success of the rollout strategy can be more accurately evaluated. This approach is important to consider in the context of the GB rollout where there have been large quantities of non-functioning smart meters in GB post installation.
- Financing considerations, particularly regarding who bears the cost, are paramount in the rollout strategy and the various options should be considered further when determining the rollout strategy. We recommend that programme costs should be fair, transparent and, where possible, aligned with benefits. **We recommend that programme costs should be recovered through customer bills**, as part of a regulated price control.

2. Introduction

2.1. Current energy landscape in NI

Northern Ireland's Department for the Economy (DfE) oversees the region's energy policy. In the latter part of 2021, the Minister introduced 'The Path to Net Zero Energy'. This strategy document highlights Smart Meters as pivotal in fostering a modern, digital energy system that not only benefits consumers through valuable data but also enhances overall system efficiency.

In the following year, the DfE commissioned a Cost-Benefit Analysis (CBA) for both electricity and gas smart meters, which affirmed the economic viability of deploying electricity smart meters. The 2024 Energy Strategy Action Plan subsequently outlined an action to finalise a comprehensive plan for the implementation of these meters, setting the stage for consumer roll-out. The next step after this report will be a design plan consultation.

DfE and the Utility Regulator (UR) are collaborating to formulate this implementation strategy for electricity smart meters and their associated systems.

2.2. Purpose and scope of this piece of work

The purpose of this piece of work is to undertake an evaluation of smart meter implementation strategies employed elsewhere to understand the key risks and challenges (in areas such as data protection, customer engagement and consumer protection), as well as to gather established best practices. The recommendations and plan formed after this research and analysis will guide the forthcoming deployment of smart meters in Northern Ireland, ensuring it is adapted to the unique requisites of the local electricity market and its consumers.

2.3. Document structure

This document presents the rationale and the plan for rolling out smart meters in Northern Ireland in 2024. It is structured as follows:

- Section 1 introduces smart meters and their benefits and explains why they are needed in NI.
- Section 2 summarises the business case for smart metering in NI, based on a cost-benefit analysis that compares different scenarios and assumptions.
- Section 3 explores the roles and responsibilities for Industry, Government, and the Utility Regulator. This section suggests which roles organisations should be accountable for.
- Section 4 gives insight to consumer protection and highlights the key considerations and options when planning a smart meter rollout. This section also covers, providing advice and support, installation protocols and the benefits of smart metering.
- Section 5 highlights data considerations when rolling-out smart meters. This section understands what went well and what did not work from other rollouts, data flows, data privacy, cyber security, network coverage and 'thick' or 'thin' infrastructure.

- Section 6 explains the functional and technical requirements of a smart meter rollout, considering the must haves, should haves, could haves and won't haves, as well as highlighting an options assessment.
- Section 7 explores the barriers to consumer buy-in. This section covers customer experience, engagement and feedback mechanisms.
- Section 8 gives insight into to the rollout strategy. This section suggests a rollout approach, prioritisation, engagement with consumers and an options assessment.
- Section 9 summaries a high-level plan of the smart meter rollout. This section provides recommendations of timeframes for various themes of delivery.
- Section 10 highlights the risks and mitigations of a smart meter rollout, considering data management, meter communication risks, vendor risk management and more.

2.4. Recap of business case for rolling out smart meters, referencing CBA

In 2022 KPMG undertook a cost benefit analysis on smart meters in Northern Ireland[3], which was published in 2023.

An economic appraisal was carried out to take account of the estimated costs and benefits of a Smart Meter rollout across NI. Costs considered include the operational and capital expenditure, as well as costs related to installation of Smart Meters. Two scenarios were considered, with benefits quantified where possible. These included benefits arising from reduced consumption, deferred investment, and environmental impacts.

The results of that economic appraisal suggested that Smart Meter deployment could offer a positive net present value to the consumer, network companies, retailers, and wider society. However, further technical analysis was recommended.

The CBA also stated that, further to quantitative results, decisions on deployment need to consider the following areas:

- Programme planning, structure and roles
- Service specification
- Regulation and legislation
- Procurement
- Consumer engagement

2.5. Guiding principles for delivering smart metering in NI:

We have set out below a set of principles that are intended to guide the design and implementation of the smart metering programme, and to help decision-making when difficult decisions are required.

2.5.1. Customers will be at the heart of Smart Metering.

[3] https://www.economy-ni.gov.uk/sites/default/files/publications/economy/smart-meters-cba-report.pdf

Smart metering is an enabler of significant benefits, but several of these can only be realised through consumer engagement, participation, and behavioural change – decisions must consider the impact on consumers and how they can be engaged and supported. Success will enable them to participate in the energy market, have the potential to save money, enable a personal green transition, support the adoption of consumer low carbon technologies, and maximise the benefit of renewable energy resources.

2.5.2. Consumers will control who can access their personal data.

Consumers must have a simple method of gaining access to their personal data and providing access to (subsets of) that data to third parties, setting out the purposes for which the data can be used. It should also be simple for a consumer to see who has been granted access to the data and to revoke that access.

It should be recognised that not all data is personal, that some data is required for regulatory purposes, and that processes such as anonymisation and aggregation have the potential to offer benefits without compromising any personal data.

2.5.3. Smart Metering installation and operation will be secure and safe.

The installation should be planned, training provided, and due care and attention during the installation process to ensure the safety and security of customers and installers.

2.5.4. Smart metering will support the low carbon transition.

The overall smart metering solution must be designed to facilitate the transition to a low carbon energy system and economy. This will include how data and digitalisation will enable individual customers to participate in, and benefit from, the smart metering programme and the changes it enables.

2.5.5. Smart Metering will be future-proofed as far as technically reasonable.

Choices affecting the selection, design, and implementation of smart metering need to consider future proofing to ensure that early obsolescence does not erode the benefits or incur unnecessary extra early costs. This will encompass the meters, communications, central IT, security, and privacy, among other things.

2.5.6. Value for money will be factored into decision-making.

Functional requirements should consider the trade-off between benefit and risk and decisions regarding the scope and completeness of roll-out should consider marginal cost of introducing new technologies and solutions to avoid erosion of benefits, but alternative arrangements for customers may need to be considered. The solution should enable suppliers, distributors and third parties to innovate to deliver additional business and customer benefits.

2.5.7. Smart metering programme costs and benefits should be fair, transparent and equitable.

The costs of the smart metering programme should be transparent to ensure the trust of consumers, any explicit cost to consumers should be clear, costs should be apportioned and allocated based on those who can benefit, and smart metering should enable all consumers, including the vulnerable, to participate and benefit.

2.6. Approach to evidence gathering

This report incorporates insights and feedback from a series of stakeholder engagement workshops and interviews with key stakeholders. These workshops brought together a diverse group of participants, whose contributions shaped the findings and recommendations of this report. The input provided a varied perspective on the NI smart meter roll-out. This report was also informed by a comprehensive literature review, that was conducted across a range of

relevant publications. These reviews build a foundation of existing knowledge, and identified current research gaps, to understand the complexities of smart meter rollouts.

3. Roles and Responsibilities for Industry, Government, and the Utility Regulator

3.1. Introduction, Objectives, and Benefits

Establishing clear roles and responsibilities for industry, government, and the utility regulator is critical to consider at the early stages of the smart meter rollout in Northern Ireland. Identifying and assigning these roles:

- clarifies the responsibilities and expectations for each stakeholder, reducing confusion and enhancing accountability throughout the rollout process
- ensures that all aspects of the rollout are clearly assigned to and managed by the appropriate parties, thereby streamlining operations, and improving the overall effectiveness of the initiative
- fosters cooperation and coordination among stakeholders, which are crucial for overcoming challenges of the smart meter rollout for consumers and the electricity system in Northern Ireland.

This section outlines the key roles and responsibilities necessary to deliver a smart meter rollout, drawing on learnings and successful aspects of other regions such as Great Britain (GB), the Republic of Ireland (RoI), and Italy. This is used to create a set of recommendations on stakeholders to deliver these roles and responsibilities in Northern Ireland. The insights and findings from this section will serve as a foundation for crafting key topics for discussion in DfE's consultations as well as a high-level roadmap development.

3.2. Evidence / Learnings

3.2.1. Learnings from Literature Review

In GB, the Department for Security and Net Zero (DESNZ) owns and oversees the rollout program. Energy suppliers act as the lead delivery organisation, responsible for installing smart meter equipment at consumers' premises, which includes a smart electricity meter, a smart gas meter, a communications hub, and an in-home display (IHD), all provided at no upfront cost. Ofgem, the government regulator for electricity markets, plays a key role by setting, regulating, and monitoring installation targets for each supplier, ensuring compliance with rollout obligations through price control mechanisms. Additionally, Ofgem regulates the Data Communications Company (DCC), which serves as the central smart metering service provider. Smart DCC is part of Capita PLC and is a monopoly company that operates under Ofgem's Smart Meter Communications Licence. Smart DCC is responsible for bridging the data flow between meters in consumers' homes and energy suppliers, network businesses, and other energy service or 3rd party companies.

Once the rollout is complete, DESNZ will pass responsibility for smart metering to Ofgem and the Smart Energy Code governance (National Audit Office, 2023). Furthermore, consumer engagement in GB is mainly done by energy suppliers and Smart Energy GB, a nonprofit organisation funded by the energy suppliers specifically to lead the national consumer engagement campaign for smart meters (Ofgem, 2024).

The UK's House of Commons (HoC) indicated that DESNZ, as the programme owner, has not sufficiently communicated the benefits of smart meters to consumers, with many consumers still unaware of or sceptical of the benefits of smart meters. In GB, Smart Energy GB is the lead for the smart meter awareness campaign, with limited direct involvement from DESNZ. Recognising that consumers in GB are not fully aware of the benefits of smart meters, the HoC recommended that DESNZ work with Smart Energy GB to review and improve the customer engagement strategy to ensure that future engagement efforts effectively drive smart meter uptake among consumers (UK House of Commons, 2023).

Evidence shows that GB energy suppliers are progressing the rollout more slowly than the government's target, with just one out of 13 large suppliers achieving both its electricity and gas smart meter installation targets in 2022. DESNZ believes that suppliers are not meeting installation targets due to underperformance rather than low consumer demand. The Smart Energy GB Outlook Tracker survey revealed that 37% of 4,655 respondents who did not already have a smart meter indicated they would seek or accept one within the next six months. DESNZ further believes that suppliers may have a commercial interest in advocating for lower installation targets, such as to avoid investing more in the rollout (National Audit Office, 2023).

However, the National Audit Office also highlighted that DESNZ has done well to collaborate with a range of stakeholders to identify and help remove barriers for rollout, such as working with suppliers to speed up installation rates after the COVID-19 pandemic and facilitating knowledge sharing between suppliers (National Audit Office, 2023).

DESNZ plans to consult on new guidance alongside on the Future Homes Standard building regulations to ensure that new homes are built smart meter ready from the outset. The Future Homes Standard will come into effect in 2025 in GB, mandating smart electricity meters in new homes.

In RoI, the Commission for Regulation of Utilities (CRU), previously known as the Commission for Energy Regulation (CER), serves as the programme owner for the smart meter rollout. CRU is responsible for key design decisions, regulations, and the high-level plan for the rollout. CRU appointed ESB Networks, RoI's sole DSO (CRU, 2024), to lead the delivery of smart meters (CRU, 2014). This appointment aligns with RoI's Programme for Government 2007, which includes a mandate for ESB Networks to install smart meters (CRU, 2010). ESB Networks is responsible for procuring and installing the smart meter and in-home display, as well as supporting the communications infrastructure to consumers and providing technical support for two years after the installation is completed. Electricity suppliers are acting as the main point of contact for consumers' requests to be prioritised for the rollout programme (CRU, 2014).

The CRU has also announced that all homes will have a smart meter by the end of 2024.

In Italy, Enel Distribuzione (now known as e-Distribuzione), the major DSO, took the initiative to pioneer the rollout of 1st generation smart meters in 2001, before any national or EU-level regulatory frameworks were put in place. Following the successful rollout, ARERA, Italy's energy regulator (previously known as Autorità per l'energia elettrica e il gas/AEEG), established regulations mandating all Italian DSOs to rollout 1st generation smart meters (Piti, et al., 2019). ARERA also set out the minimum smart meter functionality requirement with inputs from Enel Distribuzione as the rollout pioneer.

Similarly, for the 2nd generation smart meters rollout, e-Distribuzione (Enel Distribuzione) initiated the rollout due to installed 1st generation smart meters nearing their end-of-life. Subsequently, ARERA mandated other DSOs to follow suit in deploying 2nd generation smart meters, setting out the necessary regulations and requirements for this phase of the rollout (ClimateXChange, 2021). Rollout is typically done in phases determined by each DSO, considering the infrastructure readiness, funding availability, and logistical consideration across each geographical area (municipality) (e-Distribuzione, 2016).

3.2.2. Learnings from Stakeholder Engagement

Stakeholder engagement, in particular the workshops completed as part of the project (described further in Appendix C), highlighted numerous learnings which should be considered by DfE for the roles and responsibilities:

- Roles and responsibilities need to be agreed early. To do this, DfE should **leverage what has worked successfully before** in other jurisdictions and in Northern Ireland (e.g. the retail Market opening).
- Roles and responsibilities need to be clear, defined, and documented with examples of how they link and interact. There was agreement that this should be delivered by **one centralised body**.
- There was a clear pattern that stakeholders do not want the roles and responsibilities to be over-engineered, where possible it should align with existing processes.
- Stakeholders believe that the key challenges to roles and responsibilities are creating:
  - A very clear governance with levels of governance between parties, and terms of reference
  - Clear roles and responsibilities for device ownership and system assurance
- The stakeholder engagement activities for this project suggest that the following stakeholders should have the following roles and responsibilities:
  - **The DfE (and other government departments)** should be responsible for: benefits monitoring, high-level designs policy decisions and overarching objectives. They should be accountable for security, such as of supply and from cyber-attacks, though they may pass the responsibility to the regulator in practice.
  - **The regulator** should be responsible for various factors, including: complaints, approving design requirements, stakeholder forum decision making, overall governance, regulatory oversight (including cost allowances) and the communication with customers on the costs of transition.
  - **A programme steering board (made up of existing bodies** such as DfE and the regulator) will need to be responsible for: data access, regulatory change control / administration, operational code for how the roll-out will work in practice, the governance of a central code and an independent and impartial assurance body to assess against any code obligations and cyber best practice.
  - **The electricity network operator** should be responsible for: data access, roll-out planning, developing design, installation of meters, data repository and the maintenance of meters
  - **Suppliers** should be responsible for: Time of Use (ToU) tariffs, the customer digital interface, customer engagement and complaints, customer journey mapping, education and the communication with customers on the cost and benefits of the transition.
  - **The consumer council** should be responsible for: the communication with customers on the cost of the transition and the education of customers that the meter will not automatically reduce the customer cost. They should also ensure that complaints are effectively dealt with.
- To allow these roles to be delivered, **regulation / legislation** should: agree on requirements, create a clear term of reference, determine ownership versus

accountability, look at existing governance and use, set principles to avoid duplication and join up the regulatory and governance frameworks.

- To allow these roles to be delivered there needs to be sufficient **skills and the workforce** in place**.** Targets should take a realistic approach to the number of installs.
- To allow these roles to be delivered there needs to be a **clear and consistent** information campaign. Some stakeholders cited this as a clear benefit of having a dedicated body, such as Smart Energy GB.
- There was a recommendation that there should be a requirement for suppliers to communicate with their customers about the options for ToU tariffs once the smart meter has been installed within a certain timeframe (as done in RoI).
- There was also a request for clear ownership for the maintenance of smart meters as this has been an issue in other rollouts.
- There was also a request for a **full public consultation process** on the design of the smart meter rollout ahead of decision.
- To allow these roles to be delivered, **governance** charts should: provide total clarity on governance (ensuring clear delineation of roles), outline decision-making process and provide a sufficient KPI and reporting obligations framework.
- Other notable stakeholders include **landlords** (to gain access to properties), **innovators**, the Information Commissioner's Office (**ICO**) (for data protection considerations), **small businesses, the agricultural sector** and **device manufacturers**.

3.3. Options Identification and Assessment

Research identified numerous permutations for the roles and responsibilities for each stakeholder. We have summarised these, outlining the rationale behind these suggestions for each stakeholder.

Table 1: Options Assessment for Smart Meter Rollout Responsibilities – This includes an assessment of the pros and cons of each stakeholder and their role in the rollout.

Organisation	Role	Rationale
Government	1. Overarching objectives and high-level design 2. Overall governance 3. Energy security 4. Benefits delivery 5. Consumer engagement	1. The government can articulate a clear vision for the rollout, aligning it with national priorities such as energy efficiency, economic growth, and sustainability. 2. The government can hold various stakeholders accountable for achieving objectives, ensuring that the rollout meets its targets. Similarly, it can allocate necessary resources, including funding and support, to help support the rollout. 3. Ensuring energy security is a fundamental responsibility of the government, critical to national security and economic stability, therefore should remain with the government.

		4. The government is bringing forward the implementation of smart meters based on the CBA previously completed and therefore they should remain, at least partly, responsible for the delivery of the benefits. 5. Authority with broad reach, and ability to ensure consistent, inclusive messaging. This ensures consumer protection, aligns with national policies, and facilitates effective coordination, monitoring, and support for all consumer segments.
Regulator	1. Consumer engagement and protection 2. Overall governance 1. Approving design requirements	1. As an independent body, the regulator can provide unbiased information and support to consumers, and consumers are more likely to trust communications and protections offered by a neutral regulatory body rather than industry players who have vested interests. 2. The regulator can coordinate between various stakeholders to align efforts, while holding different parties accountable for their roles and responsibilities, ensuring adherence to timelines, standards, and regulations. 3. Using the regulator to approve design standards will ensure consistency across all smart meters, facilitating interoperability, ease of use, desired functionality, and quality assurance.
Network	4. Data access 5. Rollout and rollout planning (i.e., design) 6. Installation and maintenance of meters 7. Communication with consumers 8. Procurement 9. Governance	1. NIEN may consider managing data access to ensure secure, reliable data flow essential for network operations and consumer services. 2. Almost all smart metering roll-outs have been networks-led, with the notable exception of the GB roll-out (Supplier led). As Northern Ireland's single network company, NIEN has strong understanding of the local network and infrastructure, which will ensure efficient and effective deployment and minimising disruptions. 3. Familiarity with the network infrastructure allows them to address installation and post installation issues swiftly and effectively. 4. As with other stakeholders they are well known in Northern Ireland and would be well-placed to communicate information if they are responsible for the rollout.

		5. Northern Ireland's common services agreement lends itself to this structure. Same as for installation above. 6. Can leverage existing arrangements facilitated by UR, focus on right level of governance once this project gets off the ground.
Suppliers	1. Tariffs (ToU) 2. Consumer engagement and journey 3. Education 4. Rollout strategy 5. Benefits delivery 6. Installation and maintenance of meters	1. Ability to leverage their market position and customer data to design attractive propositions and competitive tariffs. 2. Suppliers have existing direct relationships with customers and communication channels. 3. Good understanding of customer service goals that can feed into strategy development. 4. Often have operational expertise to manage timelines and deliverables. 5. Suppliers will have access to smart meter data and can leverage this to offer improved services and savings to consumers. 6. Responsible for billing consumers correctly and therefore have a vested interest to ensure correct installation and maintenance of meters.
Consumer Council	Consumer engagement	Their role as an advocate will provide unbiased information and support to ensure accurate communication and complaints/issues are effectively dealt with.
Programme steering board	1. Regulatory changes / control 2. Governance 3. Programme governance 4. Assurance for data / cyber aspects	A programme steering board needs to be set up to consider overall programme governance. This would likely be lead by the DfE and include the regulator and possibly other key organisations too. It has been included here, despite not being a specific body as such because of the importance of having such a governance arrangement in place. This will provide greater transparency and keep consumers interests at their core.
Information Commissioner's Office (ICO)	1. Support consumers in relation to the processing of their personal data 2. Provide help and support to	As the information rights regulator, the ICO is in a position to provide advice and guidance to consumers and organisations. They have a range of enforcement actions they can use where appropriate, including: • Information notices

	organisations processing personal data	• Enforcement notices • Penalty notices • Inspection powers

3.4. Recommendations

Based on our analysis and consideration of the various options for the roles and responsibilities, we have several strategic recommendations. Each recommendation is supported by the detailed analysis completed as part of this project to address concerns raised by various stakeholders. Our recommendations include:

- Recommendation that the following roles and responsibilities are assigned to the following stakeholders:
  - **Roll-out strategy and planning:** A network led rollout has received strong levels of support during stakeholder engagement and literature research has identified this as a common and successful approach. Therefore, we recommend NIEN should take the lead in both the rollout and roadmap development for the rollout. This should include design decisions for smart meter and systems functionality. We would recommend the Utility Regulator (UR) to provide oversight on the design decisions due to its role in regulating the industry.
  - **Installation:** For installation there are two key options, network led, or supplier led. We recommend this is network led to ensure the whole rollout process remains under NIEN responsibility. This approach benefits from more efficient rollout while Northern Ireland's common services model lends itself to this structure, with meter replacement already falling under this model.
  - **Procurement:** We recommend that NIEN is also responsible for the procurement of smart meters and the associated systems to enable it to be fully responsible for the whole process. A single organisation procuring from a single (or limited number of) meter provider(s) enables far fewer permutations of devices and providers for the end-to-end success of smart metering. The number of permutations was a key challenge for the rollout in GB and therefore this should be limited as much as reasonably possible. Additionally, Northern Ireland's small metering base means that economies of scale through competitive tendering of meters cannot be achieved, whereas the common services model lends itself to this structure.
  - **Programme management function / governance:** In line with recommendations that NIEN should manage the rollout, it should therefore be responsible for establishing a governance approach to effectively project manage and monitor the rollout process, ensuring accountability and transparency throughout. Oversight of this approach and monitoring of the strategy and rollout should be undertaken by UR to provide regulatory oversight, with the Consumer Council appointed to ensure there is an independent body with a consumer focus.
  - **Regulatory revisions:** This should be a collective responsibility for UR, who currently is responsible for the regulation for the industry, and NIEN who we recommend being responsible for the rollout delivery. The Department of Finance should be involved to consider whether Building Regulations could be changed, so that it could be mandated that all new homes be built with a smart meter already installed.

- **Consumer engagement:** We recommend this is a multi-party responsibility and all parties work together in a coordinated approach. In particular, we recommend that the following stakeholders have the following roles in a coordinated approach: The government should be responsible for the initial announcement, the Consumer Council being responsible for the public awareness campaign, with NIEN, and suppliers communicating benefits. This process should be overseen by UR. For business customers, a business representative organisation should be used to communicate with customers. The need for this approach is discussed further in Section 7: Barriers to Consumer Buy-in. Stakeholders should be involved using a 'co-design' approach (including consultations, workshops, stakeholder engagement etc) at appropriate points. This should happen, for example, at the procurement stage of sourcing meters, to make it more likely that the meters will meet the needs of various groups.
- **Meter communications and data management:** It is important to explicitly manage associated risks from an "open by default" approach to energy data (discussed further in Section 5: Data). An overarching programme steering board (made up of DfE, UR and potentially other parties too) should hold overall accountability for this, to oversee the development of protocols to ensure data is open.
- **Consumer protection:** UR should be responsible with support from the Consumer Council, both of which are required to protect consumers. Consumer protection requirements is discussed in Section 4: Consumer Protection.
- **Benefits delivery:** Several stakeholders should be responsible for the delivery of smart meter benefits. We recommend that UR are responsible for monitoring benefit implementation whereas NIEN and the suppliers are responsible for the delivery of benefits as these stakeholders will be responsible for the rollout and offering attractive consumer propositions, as per our recommendations.

- The rollout of smart meters in Northern Ireland presents the opportunity to plan the roles and responsibilities right by **working backwards from the objectives** and make sure roles and responsibilities are aligned with those and a customer centric approach.

4. Consumer Protection

4.1. Introduction, Objectives, and Benefits

Addressing consumer protection for smart meters in Northern Ireland is critical to consider at the early stages of rollout design. Ensuring that consumer rights and needs are safeguarded is essential for the project's success through widespread trust and adoption. Identifying and addressing these consumer protection requirements is important as it:

- reduces the risk of consumer dissatisfaction and resistance, which can delay implementation, increase costs, and reduce the effectiveness and realised benefits of the rollout across communities in Northern Ireland
- ensures that the functionality of smart meters meets the needs of the prepayment market, including the principles, approach, and technology needed to substitute traditional meters with smart meters and provide Pay-As-You-Go (PAYG) options
- fosters trust and cooperation from the public, which are crucial for achieving widespread adoption and maximising the benefits.

This section outlines the key consumer protection requirements for smart meters, including discussion on the specific needs of the prepayment market, functionality of meters where applicable, and the principles and approach needed for PAYG options. These requirements have been identified through literature reviews and a dedicated workshop on the topic. The insights and findings from this section will serve as a foundation for crafting key topics for discussion in DfE's consultations as well as a high-level roadmap development.

4.2. Evidence / Learnings

4.2.1. Learnings from Literature Review

In GB, Ofgem (GB's energy regulator) is responsible for regulating energy suppliers, making sure consumers are protected, as well as governing the Smart Energy Code. (Dancer, 2023). In particular, suppliers must comply with privacy laws like the UK GDPR and Data Protection Act 2018. The Data Protection and Digital Information Bill (which fell when the 2024 election was called) might be introduced again and this would impact smart meter data access. Consumer consent is the sole approved method for data access, as per privacy plans approved by Ofgem, the Smart Energy Code, and the Smart Meter Data Access Privacy Framework. All parties accessing smart meters are required to comply with privacy frameworks, GDPR and the Data Protection Act.

There was an instance where households were having their energy smart meters remotely switched to prepayment mode, which in GB have often had less favourable tariffs. (Smith, 2022) This was being done without their permission and it left customers at risk of running out of energy, and at times households had been left without power for days or even weeks. This ability for customers to be switched to prepayment mode without their permission came about following the installation of the smart meters, which resulted in a much simpler process for a supplier to swap the customer into prepay mode at the push of a button, rather than having to apply for a warrant and install a physical meter (as was previously the case). Ofgem's rules state that energy companies must speak to customers before moving them on to a prepayment meter, but there were concerns this was not always happening.

In addition to addressing the above issue, another key challenge the rollout in GB faced was properties where smart meters cannot be installed, which were not adequately addressed. This might be, for example, where comms connectivity is an issue due to a remote or rural location or where the meter is inaccessible. Therefore, one key takeaway is to define how to support households that cannot install smart meters and to provide access to smart technology trials for low-income households.

In the Republic of Ireland, only ESB Networks has access to the customers' smart meter. The smart meters have been independently tested from a cyber security perspective and are protected by industry standard security systems to ensure consumers are adequately protected. The security testing and a review are done regularly to ensure this remains the case.

Additionally, ESB Networks is required to comply with the Data Protection Act and GDPR when handling the smart meter data, again discussed later in this report. ESB Networks should not favour any particular supplier in the rollout.

Any changes requested for the smart meter data need to be evaluated in accordance with ESB Networks' GDPR procedures. Should there be any issues with data handling, ESB Networks should then fix and update the data as needed to ensure compliance with GDPR.

In Italy and based on the Legislative Decree 102/2014, benefits for end customers were the basis for the minimum functionality of the meters. Data privacy and security are guaranteed to follow current legislation and protection of personal data. Consumer protection and data management for the second-generation rollout are regulated under ARERA 105/2021.

To protect all consumers in Italy, smart metering allows non-paying customers to get a minimum vital service of 0.5kW for 2 weeks before full disconnection. Furthermore, consumers have the right to access and request their consumption data through the IIS' website and access to this portal requires authentication through the Public Digital Identity System (PDIS). Italy's Legislative Decree 102/2014 guaranteed the data exchange security, confidentiality, consumer rights to data access and data privacy protections.

4.2.2. Learnings from Stakeholder Engagement

Stakeholder engagement, primarily from the workshops, highlighted numerous learnings which should be considered by DfE for consumer protection.

- The smart meter roll-out in Northern Ireland needs to keep **consumers at the core** of the project and it should not become just an infrastructure project. This was highlighted numerous times throughout our engagement with stakeholders across all topics discussed.
- It is critical to keep the Northern Ireland context in mind; **smaller population and high proportion of pre-payment / keypad meters** need to be considered from the outset in terms of protection.
- **Clear benefits** of smart meters need to be provided. This should include automated, near real-time information on energy usage, improving convenience compared to manual monitoring. Benefits should extend beyond accurate billing to transforming how consumers interact with energy providers.
- **Potential risks** to the smart meter rollout include: perceived loss of control over data privacy and pricing, challenges with remote switching functionalities and customer understanding of tariff changes.
- There is a need for **clear consumer protections and stable regulations** to increase consumers' confidence in adopting smart meters. Consumer protection should cover

broad details such as detailed installation procedures and safeguarding measures to protect consumers against unexpected tariff changes or disruptions.

- The **installation process** is key, as it is a great opportunity to increase awareness of how to use and benefit from smart meters.
- It is important to **futureproof technologies** and systems to adapt to evolving standards and communication protocols. A ‘thin’ model for the smart meter could support this but needs to ensure, at a minimum, the meters have the functionality of existing keypad meters.
- Realistic expectations are essential. Previous rollout targets in other regions were adjusted due to challenges, and expensive solutions have been implemented to have the potential to achieve a near 100% roll-out.
- 'Traditional’ non-smart meters are gradually becoming more difficult to procure so at some point all consumers may need to have their traditional meter replaced by a smart meter. Therefore, it may not be sensible to take a voluntary approach, although it may be possible to have a smart meter operating in non-smart mode, although additional costs are likely to be incurred and it needs to consider who should bear these costs. This needs further consideration and clear messaging.
- There was consideration of appropriate targets – whether these should consider meters installed (similar to the key indicator for GB), or that the smart meters are fully operational (for which a clear definition would be required).
- It is important to consider non-domestic consumers in the design of the rollout. An example of a key non-domestic group in Northern Ireland that needs to be included in the design of the rollout and tariffs is the agricultural sector. There were concerns raised about the impact of dynamic electricity pricing for farms as, for example, analysis on dairy farms has shown around 62% of dairy electricity was used at peak periods. In many cases it is not possible to change the timing of energy intensive activities in these farms. Therefore, higher costs during peak periods could drive up bills. This could be mitigated against by, for example, using renewable sources to generate energy and battery storage to drawn down when prices are higher.

4.3. Key Considerations and Options Identification

To address consumer protection concerns and issues, several key aspects must be considered for effective engagement and safeguarding of consumers. This section outlines the critical aspects that need to be considered to overcome the challenges identified with consumer protection.

4.3.1. Roles and Responsibilities

There is a need for consumer protection principles and arrangements governing stakeholders involved in the rollout. This will help deliver benefits for consumers, engage consumers, and most importantly protect consumers. Protection covers topics such as:

- unauthorised access to data
- identifying and managing vulnerable customers
- no auto switching to prepay mode for debt repayment purposes
- monitoring self-disconnection
- supporting consumers to select suitable tariffs
- no hard sales at installation

- providing advice to consumers.

This will need to be wrapped up in a well-defined engagement strategy to cover all the topics outlined above. The responsibility for engagement with consumers is discussed in more detail in Section 3: Roles and Responsibilities while the engagement strategy is discussed in Section 7: Barriers to Consumer Buy-in. Different approaches can be considered here, such as oversight by a single stakeholder or a coordinated approach involving multiple parties.

4.3.2. Providing advice and support

Providing consumers with sufficient support and protecting them from issues such as disconnections are a vital aspect of the smart meter rollout in Northern Ireland, particularly to safeguard vulnerable consumers. There are several key measures that should be considered to prevent disconnection and to provide support to all consumers, especially those at risk:

- **Accessible support for all consumers:** Providing accessible support through various means, such as online platforms and phone services, ensures that all consumers can easily obtain assistance when needed. This includes support for several topics including: billing issues, payment plans, and understanding how to use their smart meters effectively.
    - This becomes particularly important for vulnerable customers, such as the elderly, disabled, or those with low household incomes. We should also consider consumers who are not are not comfortable engaging with technology or with limited access to the internet. It is important to identify who the vulnerable groups are in Northern Ireland and provide tailored support ensure these consumers remain connected to the electricity grid.
    - Similarly, smart meters should not merely be installed and forgotten about. There should be sufficient levels of support provided to guarantee their reliability. This should include regular performance checks, timely repairs, and updates to the system software. This proactive approach minimises disruptions and builds consumer trust, reinforcing the reliability of smart meter technology and protecting customers against failures.
- **Specific protections:** Implementing specific protections for vulnerable consumers, such as friendly credit and emergency credit or additional time to pay, helps prevent issues such as disconnection for those facing temporary financial difficulties. These protections ensure that consumers have the opportunity to manage their energy usage and payments without the threat of losing access to electricity. One example is Italy where non-paying customers get a minimum vital service of 0.5kW for 2 weeks before full disconnection.
- **Switching to Prepay:** Allowing customers to switch to a prepayment plan can provide an alternative to total disconnection. This approach allows consumers to manage their energy consumption more effectively and maintain control over their energy usage. However, there needs to be monitoring and controls around consent processes, as highlighted in the GB rollout, where customers, unbeknown to them, were automatically switched to prepayment plans and resulted in them being disconnected.

Implementing these measures will help create a fair and supportive environment, ensuring that existing consumer protections continue, and any new protections or measures specifically needed for smart meters are implemented', and not left without essential energy services.

4.3.3. Data

Ensuring robust consumer protection in the smart meter rollout necessitates careful consideration of data management. It is important to implement data protection by design and

default approach when rolling out smart metering in NI to protect personal data. Clear messaging on how consumer data is being used and who is able to access this data, along with providing choices for data sharing preferences, such as the use of consent tokens, is crucial for protecting customers. Data privacy and security must be prioritised to protect consumers from potential breaches and misuse, while compliance with relevant data protection regulations is essential.

Any organisations processing personal data must adhere with UK GDPR, as well as any other relevant legislation such as the Privacy and Electronic Communications Regulation (PECR). Organisations undertaking processing relating to smart meter data should consider completing a data protection impact assessment (DPIA).

Discussions on these aspects, including options for maintaining data integrity and consumer confidence, are provided in Section 5: Data.

4.3.4. Protocols around installation

Establishing clear protocols around the installation of smart meters is essential to ensure a smooth and secure process for both consumers and installers. Proper installation protocols safeguard consumer interests and enhance the effectiveness of the rollout. Key consumer protection aspects to consider during the installation include:

- **Access to properties:** Gaining access to properties for meter installations has been a significant challenge in other rollouts, leading to increased costs and delays. Clear and respectful protocols should be established to ensure that installers can access properties efficiently and without causing inconvenience or distress to consumers. Proper scheduling and communication with consumers about the installation process are crucial to overcoming this barrier.
- **Opportunity to detect vulnerability:** The installation process provides a unique opportunity to identify vulnerable consumers who may require additional support. Installers should be trained to recognise signs of vulnerability and have protocols in place to refer these customers to appropriate support services if required. This ensures that vulnerable consumers receive the help they need and are not disadvantaged by the rollout.
- **No hard sales or selling additional services:** To maintain consumer trust and focus on the primary objective of the smart meter rollout, installers should not engage in hard sales tactics or attempt to sell additional services during the installation visit. Clear guidelines and training should be provided to ensure that the installation process is purely focused on setting up the smart meter and providing necessary information about its use.
- **Ensuring smart meter functionality:** Installation protocols should be sufficient to include testing to ensure meters continue to work effectively and with full functionality at the time of installation and therefore post-installation.

By addressing these key aspects, the installation protocols will not only facilitate a more efficient rollout but more importantly it will also protect consumer rights and interests, ultimately leading to greater acceptance and satisfaction with the smart meter program.

4.3.5. Availability of Benefits from Smart Metering

Ensuring that the benefits of smart metering are accessible to as many consumers as possible is crucial for the success of the rollout. In particular, the below points are important for ensuring that there is sufficient consumer protection:

- **Consumer Propositions Including Time-of-Use (ToU) Tariff Availability:** The availability of ToU tariffs is essential to deliver tangible benefits to consumers. These tariffs must be attractive enough to incentivise consumers to switch and use energy more efficiently, ultimately reducing their energy bills. Without well-structured ToU tariffs, the potential savings and efficiency gains from smart meters cannot be fully realised. However, it is important that sufficient information and advice is available to help consumers choose appropriate tariffs. Consumers must not be pressured to accept inappropriate tariffs, and it should be recognised that ToU tariffs are not suitable for all consumers. Consumers should not suffer detriment as a result of their tariff choices.
- **Access to Smart Meter Data:** Providing consumers with easy access to their smart meter data is key. Empowering consumers with detailed insights into their energy usage enables them to make informed decisions about their consumption patterns, leading to increased energy savings and more efficient energy use. Access to this data should be straightforward, secure, and user-friendly. This is discussed further in Section 5: Data.
- **Future-Proofing Technology:** It is important that the smart metering technology is future-proofed to avoid additional costs and ensure long-term cost-effectiveness. The smart meters should be capable of accommodating future advancements and integrations without requiring extensive and costly upgrades or early replacement. This approach ensures that the investment in smart metering technology remains valuable over time.
- **Ease of Use:** A significant challenge identified is ensuring the smart metering system is easy to use. This can be addressed by providing user-friendly interfaces, whether through an app or straightforward smart meter functionality. Simplifying the user experience is critical to maximising the adoption and effective use of smart meters, as discussed in Section 6: Technical and Functional Requirements.

Establishing robust consumer protection protocols increases the chances that the full benefits of smart metering will be realised by customers. This includes providing attractive ToU tariffs, easy access to smart meter data, future-proof technology, and ensuring ease of use. These measures build trust in the technology, safeguard consumer interests, and enhance the overall cost-effectiveness and acceptance of the smart meter rollout.

4.4. Recommendations

Based on our analysis and consideration of the various options for consumer protection, we have several strategic recommendations. Each recommendation is supported by the detailed analysis completed as part of this project to ensure there is a consumer focus that adequately addresses concerns raised by various stakeholders. Our recommendations include:

- We recommend that consumer protection principles and arrangements are required and must be **governed by the Utility Regulator with support from the Consumer Council,** as discussed in Section 3: Roles and Responsibilities. Delivering benefits for consumers, engaging consumers, and protecting consumers is paramount to the success of a smart meter programme.
- Consumer protection at a minimum should **cover broad details such as installation procedures and safeguarding measures** to protect consumers against unexpected tariff changes or disruptions.
- Challenges with **remote switching functionalities and disconnections need to be considered from the outset,** and the DfE should complete further work to outline how this should be done. This is particularly important for vulnerable customers, as the GB rollout faced significant negative press due to automatic switching and disconnection of

customers. Consumers need to be provided with sufficient support throughout, and post rollout, and communication to all consumers and vulnerable groups need to be considered. Engagement efforts are discussed further in Section 7: Barriers to Consumer Buy-in. It should be noted that remote disconnection functionality is complex and costly because of the need for very high levels of cyber security to protect the energy system. We recommend that an economic assessment of the extra cost of this functionality against a counterfactual is carried out, considering the (likely few) instances where this is required and the cost of sending an engineer to de-energise the meter locally.

- We recommended **ensuring ToU tariffs are in place and are a competitive option** for consumers. There should be clear outcomes for ToU tariffs, such as making electricity cheaper and greener, and DfE should work backwards from these outcomes to set governance arrangements. This should consider introducing regulations mandating retailers to offer ToU tariffs to ensure they offer value for money. Regulation ensuring that consumers are provided necessary information and advice to make informed decisions, are not unduly pressured, and that appropriate monitoring is established should also be introduced.
- **Consumers should be able to access near-real-time data** to enable engagement and encourage energy savings, such as during Demand Side Response (DSR) events. They should also be able to access historical information and securely provide permission to third parties to access this data, as discussed further in Section 5: Data.
- It is important to acknowledge that **some consumers may not be able to access full functionality of a smart meter.** This could be, for example, where comms connectivity is an issue due to a remote or rural location or where the meter is inaccessible. Further work should be undertaken to identify potential causes for this in Northern Ireland and to identify alternative solutions or other measures to ensure that these consumers can benefit from low carbon technologies.
- The smart meter rollout in Northern Ireland needs to **keep consumers at the core** of the project and should not become merely an infrastructure project. This was highlighted numerous times throughout our engagement and a consumer-centric rollout will help enable benefits to be realised.
- Establishing clear **protocols around the installation of smart meters is essential** to ensure a smooth and secure process for both consumers and installers.

5. Data

5.1. Introduction, Objectives, and Benefits

The data requirements for smart meters in Northern Ireland is a critical consideration that must be made at an early stage of rollout planning. Ensuring proper data management is essential for ensuring secure and efficient data flow, which allows all required data to be recorded. Identifying and addressing these requirements:

- reduces the risk of data breaches and cyber security threats, which can compromise consumer trust and delay implementation, increasing costs and reducing the effectiveness of the rollout
- ensures that data protection and privacy requirements are met, thereby complying with legal standards and safeguarding consumer information
- increases the level of cooperation from the public, which is crucial for achieving widespread adoption and maximising the benefits of the rollout for both consumers and the electricity system in Northern Ireland.

This section outlines the key data requirements for smart meters, including data flow, data protection/privacy requirements, and cyber security risks and measures, which have been identified through literature reviews and a dedicated workshop on the topic. The insights and findings from this section will serve as a foundation for crafting key topics for discussion in DfE's consultations as well as a high-level roadmap development.

5.2. Evidence / Learnings

5.2.1. Learnings from Literature Review

In GB, smart meters are designed to store 13 months of historical data. Few organisations are able to access that data – being limited to the customer's supplier, the distribution business, and authorised third parties. Going forward, Ofgem has proposed to classify aggregated smart meter data as 'open' energy system data, requiring its provision in a standardised and interoperable manner by 2024. This initiative could establish a pathway for accessing smart meter data through the networks (who can access data from all smart meters in their distribution area, apply aggregation rules and make the data available according to defined rules) (Energy Systems CATAPULT, 2023), allowing additional parties to access aggregated data and enable further benefits to be derived from smart meter data without disclosing any individual's personal data. This is a key learning from literature review and again mentioned during stakeholder engagement, with maximising data access helping to ensure consumer benefits are enhanced.

In terms of data privacy and security, suppliers must comply with privacy laws including the UK GDPR and Data Protection Act 2018. The Data Protection and Digital Information Bill (which fell when the 2024 election was called) might be introduced again and this would impact smart meter data access. Consumer consent is the sole approved method for data access, as per privacy plans approved by Ofgem, the Smart Energy Code, and the Smart Meter Data Access Privacy Framework. Additionally, Privacy Enhancing Technologies (PET) are mandated for entities managing smart meter data to ensure its protection.

In the Republic of Ireland, only ESB Networks is allowed to record, collect, and process data from smart meters. Smart meters are required to provide 24h cumulative register data, interval

data and standard smart tariff (SST) register data, instrumentation data, and event data. As per the Metering Code, data for smart tariff consumers are retained for 7 years while other data is kept for 2 years. ESB Networks is required to comply with the Data Protection Act and GDPR when handling this smart meter data. Additionally, ESB Networks should not favour any supplier in the rollout, such as by installing smart meter for one supplier before any other supplier.

However, there were issues with smart meter data access which prevented consumers from accessing their own smart meter data unless they selected a smart tariff, which was often more expensive than the existing tariff they were on. This resulted in a slow uptake of smart tariffs and it was not until the ESB Networks online customer portal was developed at a later stage when consumers could apply to access their data without selecting a smart tariff.

Additionally, CRU is now developing a new Smart Meter Data Access Code, that will allow data interoperability per the EU 2023/1162 “Implementing Regulation” for providing access to metering and consumption data.

In Italy, a central database (Integrated Information System / IIS) operated by Acquirente Unico Spa collects and manages metering data and oversees the data exchange. The second-generation smart meter rollout will be followed with a transition to a big data approach, upgrading the existing system to handle up to 7,000 billion remote readings per year, a significant increase from the previous capacity of 450 million datapoints per year.

In respect to data access, consumers have the right to access and request their consumption data through the IIS website. Access to this portal requires authentication through the Public Digital Identity System (PDIS). In regard to data security, Italy’s Legislative Decree 102/2014 guaranteed the data exchange security, confidentiality, consumer rights to data access and data privacy protections.

5.2.2. Learnings from Stakeholder Engagement

Stakeholder engagement highlighted numerous learnings which should be considered by DfE for data requirements.

- Stakeholders were interested in accessing various datasets including **supplier billing data** and **profile data** as well as **network real-time data**. There were challenges outlined with accessing this data including the appropriate availability / restrictions to access and the volume of alerts.
- The **most severe risks** highlighted about smart meter data were:
  - Access & use of data by unauthorised stakeholders
  - Using the data to identify customer behaviour (e.g. presence/absence of people in household)
  - Cyber security incidents
  - IT security of data access points/API
  - Energy system attack/blackouts
- **Key lessons regarding data from other roll-outs** include:
  - Canada’s central metering database
  - Italy’s reduction in energy theft by consumers
  - Banking and telecommunications solutions to personal data
  - GB’s centralised sharing through trusted agents
  - International water metering’s fault and leak detection

- There was a general agreement that Northern Ireland should roll out a **'thin' smart meter infrastructure**. Some of the positives of this approach include a centralised data system and a simpler, cheaper, and quicker to change structure. Some difficulties around this approach may include a reduction in the energy information presented to customers and additional challenges when switching from credit to repayment.
- There were no significant benefits identified by stakeholders for a **'thick' infrastructure** approach. Instead, some concerns about this approach included:
  - The complexity and cost of metering and ongoing operation
  - Additional complexity in configuring smart meters to ensure the set-up is correct
  - Meters needing more frequent firmware updates to align with wider communications / infrastructure updates
- The **large proportion of pre-payment meters** in Northern Ireland and the apparently high level of satisfaction with the existing solution, meaning that the replacement smart metering solution must be at least as good as the replacement solution.
- A key takeaway is to reflect some of the evolution in the GB market regarding the **"open by default" approach to energy data.** This will encourage innovation and ensure industry parties do not artificially constrain the use of data across the wider market. A dedicated workstream is likely to be required to appropriately define what data can be made open and developing the systems and processes to enable this, along with ongoing support to review these processes..
- The **remote 'off switch'[4] is a key security vulnerability** which requires excessive security compared to its value. This feature should be considered carefully before introduction, together with the general principle of "keep it simple" is fundamental to an efficient deployment and operation.

5.3. Options Identification

5.3.1. Smart Meter Data Access and Flows

When exploring the use cases for smart meter data, it is essential to consider the wide range of applications and benefits that this data can provide and who can benefit from access to this data. The effective use of smart meter data has significant implications for energy management, consumer engagement, and the overall efficiency of the electricity network and wider system. Understanding these use cases is crucial for leveraging the full potential of smart metering technology and maximising benefits for both consumers and the energy system.

However, there are several challenges that arise from this, in particular, consumer data could be sold to third parties without permission. This can lead to privacy violations, loss of consumer trust, and potential legal issues. Similarly, authorised parties, such as energy suppliers and network operators, need access to smart meter data to perform accurate billing, monitor the energy network, and provide customer support. If these parties cannot access the data due to technical issues or restrictive data access policies, it can hinder their ability to perform these essential functions.

The key options that need to be considered for smart meter data use include:

[4] Remote 'off switch' being functionality that allows a command to be sent to the meter to disable supply.

- **Consumer near real-time information –** This information can be delivered through several means depending on the technical and functional specifications of a smart meter which include: via an in-home display (IHD); via an app or web interface connected to an API; via use of a smart meter with a P1 port, by including a Wi-Fi or Bluetooth in the smart meter for local connection. Relatively high-frequency connections to the meter and high data resolution are necessary to provide accurate and timely updates.
- **Near real-time network information –** This is critical for identifying and responding to outages and faults quickly. Smart meters could send alerts in real-time.
- **Historical network info –** Aggregated and anonymised historical network information is vital for network planning purposes.
- **Historical usage data –** Access to historical usage data through an app or web interface, which can also allow third-party access is another consideration to be made. This data, typically accessed by the consumer, can be extended to third parties if the consumer provides permission. This data does not need to be high-frequency or high-resolution. Proper authentication mechanisms must be in place for this, especially for third-party access, to protect consumer privacy.
- **Supplier billing data –** This is crucial to enable suppliers to bill customers.

5.3.2. Data Protection and Privacy

Protecting data privacy and ensuring robust data protection measures are paramount considerations in the implementation of smart meter technology. The data collected by smart meters goes beyond energy consumption figures - it can potentially reveal personal habits and behaviours of consumers, raising significant privacy concerns. This detailed level of information poses risks if accessed by unauthorised parties, necessitating careful safeguards and protocols. Therefore, prioritising data protection and privacy measures is essential to instil consumer trust and ensure responsible handling of sensitive information in smart meter deployments.

There are several options that can be considered to ensure there is sufficient data protection:

- **Anonymisation and Aggregation:** Implementing robust anonymisation and aggregation techniques to mask individual consumer identities and behaviours is one key aspect to consider.
- **Consent Mechanisms:** Establish clear and transparent consent mechanisms for data collection, ensuring that consumers are fully informed about the types of data being collected, how it will be used, and who will have access to it.
- **Access Controls:** Implement strict access controls to limit access to smart meter data only to authorised personnel or entities with a legitimate need, in line with GDPR's principle of data minimisation.
- **Data Encryption:** Utilise strong encryption protocols to protect data both in transit and at rest, safeguarding it from unauthorised access or interception.
- **Privacy by Design:** Adopt a privacy-by-design approach throughout the smart meter rollout process, embedding privacy and data protection considerations into the design and implementation of the technology from the outset.
- **Data Retention Policies:** Establish clear policies for data retention and deletion, ensuring that data is not retained for longer than necessary and is securely disposed of when no longer needed.

- **Data Security Measures:** Implement robust cybersecurity measures to protect smart meter infrastructure from cyber threats and breaches, including regular security audits, vulnerability assessments, and intrusion detection systems.
- **Consumer Rights Awareness:** Educate consumers about their rights regarding their personal data collected by smart meters, including the right to access, rectify, and delete their data, as stipulated by GDPR.

5.3.3. Cyber Security

Ensuring robust cybersecurity measures is crucial in the deployment of smart meter technology. While smart meters offer valuable insights into energy consumption patterns, they also collect sensitive data that could compromise consumer privacy if breached. In the worst case this will impact energy security and cause blackouts across the networks. Therefore, unauthorised access to such information poses significant risks, emphasising the need for stringent safeguards and protocols.

At a high-level there are several cyber security measures that could be considered in the rollout strategy. These include:

- **Network Segmentation:** Partition of the smart meter network into separate segments to limit access and mitigate the impact of potential breaches on the entire network.
- **Intrusion Detection Systems (IDS):** Deploy IDS to monitor network traffic and detect any suspicious activity or unauthorized access attempts.
- **Endpoint Security:** Implement robust security measures on smart meter endpoints to prevent malware infections and unauthorised access.
- **Encryption:** Encrypt data both in transit and at rest to protect it from interception or tampering by unauthorised parties.
- **Authentication Mechanisms:** Use strong authentication methods, such as multi-factor authentication, to verify the identity of users accessing the smart meter network.
- **Regular Security Audits:** Conduct regular security audits and assessments to identify vulnerabilities and address them proactively.
- **Incident Response Plan:** Develop and implement an incident response plan to effectively respond to and mitigate cybersecurity incidents in a timely manner.
- **Employee Training:** Provide cybersecurity awareness training to employees to educate them about potential threats and best practices for mitigating risks.
- **Vendor Risk Management:** Evaluate and manage the cybersecurity risks posed by third-party vendors involved in the smart meter ecosystem, such as meter manufacturers and software providers.
- **Compliance with Regulations:** Ensure compliance with relevant cybersecurity regulations and standards, such as the NIST Cybersecurity Framework or ISO/IEC 27001, to maintain the security of smart meter deployments.

While cybersecurity measures are crucial, the specific options listed here, such as network segmentation, intrusion detection systems, and encryption, have not been assessed in detail due to the high-level nature of this plan. It is important to engage cybersecurity experts to evaluate and then implement these measures effectively.

5.3.4. Smart Meter ‘Thick’ or ‘Thin’

When determining the need for data storage for smart meters, it is essential to consider the different models available, particularly the need for thick and thin smart meter models (more

information on 'thick' and 'thin' is provided in section 6.3.1). The choice between these models has some major implications for the rollout strategy, data infrastructure requirements, and overall consumer experience. While this is an important consideration for smart meter data storage and functionality, these options are discussed in more detail in Section 6: Functional and Technical Requirements.

5.3.5. Network Coverage

Smart meters rely on robust connectivity to transmit data. In areas with poor network coverage, data transmission can be unreliable, leading to gaps in data collection and continuation of estimated bills until coverage returns or meters are read locally. To address this risk, appropriate communication methods need to be considered for smart meter data. This is discussed further in Section 6: Functional and Technical Requirements.

5.4. Options Assessment

For each category and option defined in section 5.3, we have assessed the pros and cons for each possible consideration. These are defined below.

Table 2: Options Assessment for Smart Meter Data – This includes an assessment of the pros and cons of each option considered in section 5.3.

Option	Pros	Cons/Challenges
Data Flows: Consumer near real-time information	• Providing **consumers** with near-real-time information about their energy usage is a vital consideration for engaging them and enabling them to reduce their energy consumption. • Facilitates **consumer** participation in **demand response** events, which may become increasingly important with Ireland's high level of wind generation.	• For many consumers, viewing this information can be a novelty, and inexpensive but engaging methods of presenting data should be sought. • Managing and processing high-frequency data requires robust infrastructure.
Data Flows: Near real-time network information	• Hugely beneficial for the **network operator** as it would allow real-time alerts that enable quick identification of outages and faults, therefore improving grid reliability and reducing downtime. • **The regulator** will also be able to monitor and enforce compliance with reliability and service quality standards, ensuring a consistent supply of energy.	• Ensuring that the alerts are accurate, timely, and can be transmitted reliably across the network without delay or loss of information can be a challenge. • Requires infrastructure that must be built and maintained to process high volumes of data.
Data Flows: Historical data	• This information would enable **network operators** to gain valuable insights for infrastructure planning and improvements. • **Energy suppliers** would be able to gain insights into consumption patterns	• Aggregated data may lack detailed insights for individual consumers. • Privacy concerns arise from the potential misuse of data if not properly secured.

	to tailor their services and pricing models. • **Regulators and the government** can monitor network performance and ensure compliance with regulations, as well as help inform policy decisions. • **Consumers** gain insights into usage patterns and can manage energy consumption effectively. • **Third Parties** can offer personalised energy-saving solutions and other value-added services. • Streamlines the ability to switch suppliers by allowing **energy suppliers** data access.	• There is additional complexity from authentication mechanisms needed to ensure data security and this is dependent on adequate connectivity.
Data Flows: Supplier billing data	• Enables suppliers to generate precise invoices for **consumers**, reducing billing errors and disputes. • **Consumers** receive accurate and transparent bills, allowing them to track their energy usage and expenses more effectively.	• Suppliers should only access data necessary for billing and must have consumer consent for any additional data access.
Data Protection: Anonymisation and Aggregation	• Safeguards individual consumer identities and behaviours. • Ensures compliance with regulations like GDPR by protecting personal data. • Allows for meaningful analysis of energy consumption patterns while preserving privacy. • Enhances consumer trust and confidence in smart meter technology and data usage.	• May result in the loss of detailed, individual-level information, limiting analysis. • Some use cases may be less effective with aggregated data. • There is a risk of re-identification through data combination or sophisticated techniques.
Data Protection: Data Encryption	• Protects data from unauthorised access. • Helps meet GDPR requirements for data security and protection. • Preserves data integrity.	• Requires robust management practices to securely generate, store, and distribute encryption keys. • May introduce latency or overhead due to encryption and decryption processes. • Can be complex and resource intensive.

		• Initial setup and ongoing maintenance costs can be large.
Data Protection: Access Controls	• Enables granular control over data access. • Compliance with GDPR by providing mechanisms for controlling and auditing data access. • Reduces the risk of data breaches. • Enhances accountability by logging and monitoring data access activities.	• Requires robust access control policies and mechanisms. • Can be complex. • Overly restrictive access controls may impede legitimate access. • Cannot fully mitigate risks associated with insider threats with legitimate access credentials.
Data Protection: Consenting Mechanism	• Empowers consumers to control their data. • Reduces the risk of regulatory penalties or legal challenges by ensuring compliance with data protection laws. • Aligns with GDPR.	• Can be complex, requiring clear communication and user-friendly interfaces. • Requires ongoing management and monitoring. • Mechanisms for consumers to easily revoke consent and manage their preferences over time must be made available.
Data Protection: Privacy by Design	• Proactive Approach minimising the risk of privacy breaches. • Aligns with GDPR requirements. • Reduces the likelihood of privacy-related issues or breaches.	• Compatibility challenges. • Trade-offs: Balances privacy considerations with other design requirements, potentially impacting system functionality.
Data Protection: Data Retention Policies	• Establishes clear guidelines. • Helps meet GDPR requirements for data minimisation and storage limitation. • Enhances accountability by documenting data retention policies and procedures.	• Can be complex, requiring legal, technical, and operational considerations. • Balancing data retention requirements with storage costs may pose challenges, especially for large volumes of data. • Managing data lifecycles effectively requires ongoing monitoring and maintenance.

		• Inadequate data retention policies may expose organisations to legal risks.
Data Protection: Consumer Rights Awareness	• Empowering consumers to exercise control over personal information. • Promotes transparency. • Helps organisations meet GDPR requirements. • Fosters trust and confidence among consumers.	• Awareness challenges. • Communication overload. • Awareness alone may not be sufficient to ensure compliance.

5.5. Recommendations

Based on our analysis and consideration of the various options for the data requirements, we have several strategic recommendations. Each recommendation is supported by the detailed analysis completed as part of this project to address concerns raised by various stakeholders. Our recommendations include:

- **An "open by default" approach** to energy data should be taken, ensuring that data is suitably anonymised or aggregated and therefore avoiding compromising the privacy of any individual's personal data. Icebreaker One[5] provides and useful overview of data protection and smart meter data in GB, along with an exploration[6] of potential 'public interest' use cases, particularly around decarbonisation of heat. This will encourage innovation[7], ensure industry parties do not artificially constrain the use of data across the wider market, and enable the benefits of smart meters to be maximised such as consumers using near real-time data to change habits. To manage associated risks, we recommend that a programme steering board oversees this process, as discussed in Section 3: Roles and Responsibilities.
- **Consumers should have a simple mechanism to provide consent to access to their data** from smart meters. This would improve and streamline the ability to switch suppliers, enable third parties to offer services such as switching advice, support demand response programmes, or provide other energy services such as personal energy / decarbonisation advice.
- We recommend the Northern Ireland smart meter rollout to **follow existing good practice on consumer consent.** Open banking is a good example of a simple system which always gains consumer consent to enable a third party to access data.
- **Smart meters and the processing of smart meter data must comply with data protection principles set out under the UK GDPR. DfE should assess whether existing data protection protocols (e.g. GDPR) are sufficient.** Due to the levels of concern around access to and use of data early in the GB rollout, additional documents specific to access to, and use of, smart metering data were created, which has made the protocols overly complicated, or possibly gone beyond legal requirements.
- A clear **assessment of what constitutes personal data would be beneficial**. For example, in GB an initial decision that an MPAN was considered personal data, even though it is the same as a random address and you are unable to assign it to a person, the industry still has confusion about which data is personal.
- DfE should **assess how to make available anonymised smart meter data.** This has been a key challenge in the Republic of Ireland and GB rollouts.

[5] Icebreaker One overview of Data Protection and GB Smart Meter Data
[6] Smart Meter Energy Data: Public Interest Advisory Group, phase 1 report considering a range of public-interest use cases.
[7] Examples could include: Policy makers using data to inform decisions on the transition to a low carbon economy; planners, government departments, and advisory bodies such as the Climate Change Committee discharging their duties with suitable information; Network businesses relying on better information to plan the grid; universities (for example UCL) conducting research to improve energy efficiency of buildings and reduce consumer bills; or commercial organisations building better propositions to help consumers save energy and money – for example Home Energy Management systems.

- A **thin smart meter infrastructure solution** appears to be a stronger solution for Northern Ireland due to a centralised data system and a simpler, cheaper, and quicker to change structure. However, further analysis is required to ensure that a thin smart meter solution can support keypad customers given how keypad currently works in Northern Ireland.
- **Further consideration needs to be given to cyber security aspects beyond this high-level design.** Research should include details on the mechanisms that should be deployed to ensure data and the network are sufficiently protected from data leaks, as well as energy security events such as blackouts.

6. Functional and Technical Requirements

6.1. Introduction, Objectives, and Benefits

Addressing the minimum functional and technical requirements for smart meters in Northern Ireland is critical to consider at the early stages of rollout design. Understanding and meeting these requirements are essential for ensuring the project's success through reliable performance and user satisfaction through the correct level of design and functionality. Identifying and addressing these requirements:

- reduces the risk of technical issues, which can delay implementation, increase costs, and reduce the effectiveness of the rollout across communities in Northern Ireland
- ensures that the technology functions as intended from installation, thereby minimising the need for subsequent interventions and maintenance
- enhances customer satisfaction through the correct level of functionality to allow for ease of use and to enable consumers to maximise the benefits from the smart meter rollout, both of which are crucial for achieving widespread adoption.

This section outlines the key functional and technical requirements for smart meters that have been identified through literature reviews and a dedicated workshop on the topic. The insights and findings from this section will serve as a foundation for crafting key topics for discussion in DfE's consultations as well as a high-level roadmap development.

6.2. Evidence / Learnings

6.2.1. Learnings from Literature Review

EU countries typically refer to the European Commission's Directive on energy efficiency (2012/27/EU) and Recommendation on preparations for the rollout of smart metering systems (2012/148/EU) to set its own smart metering requirements. This includes Ireland, which referenced the EC Directive in its high-level smart metering system design and law (statutory instrument) governing energy efficiency – S.I. No. 426 of 2014. The minimum functional requirements of smart meters based on 2012/148/EU is outlined below.

Table 3: Minimum functional requirements for smart meters as recommended by the European Commission (2012/148/EU)

Category	Minimum requirement
Customers	Provide readings directly to the customer and any third party designated by the consumer
	Update the readings provided to customer and any third party designated by the consumer frequently enough to allow the information to be used to achieve energy savings
Metering operator	Allow remote reading of meters by the operator

	Provide two-way communication between the smart metering system and external networks for maintenance and control of the metering system
	Allow readings to be taken frequently enough for the information to be used for network planning
Commercial aspects of energy supply	Support advanced (smart) tariff systems
	Allow remote on/off control (remote switching) of the supply and/or flow or power limitation
Security and data protection	Provide secure data communications
	Fraud prevention and detection
Distributed generation	Provide import/export and reactive metering

In addition, the 2012/27/EU Directive further requires EU countries to ensure the privacy of final customers according to relevant EU data protection and privacy legislation.

GB published response to consultation on minimum smart meters functionality in 2011 (DECC, Ofgem, 2011), setting requirements that closely aligned with the EC Recommendation (although this was published later in 2012). GB then developed the detailed requirements via the SMETS document (Smart Metering Equipment Technical Specifications), which was then notified to the European Commission. The current version of SMETS was released in 2012 with minor updates made in 2014 (DECC, 2013), followed by multiple maintenance updates. For GB context, first generation smart meters are referred to as SMETS 1 while second generation smart meters are referred to as SMETS 2.

Italy was at the forefront of the smart meter rollout, beginning in 2001 and completing the first generation of smart meter installations by 2011. This was prior to the publication of EC Recommendation 2012/148/EU. Most of the first-generation smart meters in Italy were installed by the Italian DSO, Enel Distribuzione, between 2001-2006, based on the company's specific design requirements (ENEL Distribuzione SpA, 2006). ARERA, the Italian energy regulator, subsequently published a directive in 2006 detailing the minimum functionality requirements for smart meters (ARERA, 2006). Other Italian DSOs adhered to these requirements when rolling out smart meters between 2006-2011.

Despite being deployed before the EC Recommendation was published, Italy's first-generation smart meters have already aligned with all the listed requirements, with one exception: they do not provide updated readings for consumers frequently enough (every 15 minutes). Instead, Italy's first-generation smart meters provide consumers with three readings each month via their energy bills (Stagnaro, 2019). However, Italy did base the functional requirements for its second-generation smart meters on the EC Recommendation (Volkwyn, 2017).

6.2.2. Learnings from Stakeholder Engagement

Stakeholder engagement highlighted numerous learnings which should be considered by DfE for the technical and functional requirements. We asked attendees to input what functions they considered the smart meters, and their wider infrastructure, in Northern Ireland must / should / could / will not have. Below is a summary of the input:

Table 4: Functional and Technical Requirements Assessment

Must Have	Should Have
• Digital front end system to increase engagement of the customer (either app or in-home display (IHD)) • Tamper reporting and alerting • Remote disconnection and reconnection capability[8] • Friendly credit and other keypad functionality • Easy to understand interfaces for consumers • Last gasp[9] functionality • Minimum 30-minute read granularity • Near real time functionality from day 1 • Ability to be installed safely and built to last • Enable energy saving • Support ToU tariffs • Align with RoI retail messaging • Data security • Ability for customers to share their data with others (and stop sharing) • Record both import and export • Good comms model, bearing in mind rural population • Remote switching between credit and PAYG • Central data platform for smart data access with API for customers and suppliers (with suppliers able to access historic data) • Data consent by consumers	• Size should be able to fit into current meter box spaces • Integration with home energy system • Enable dynamic real-time load control for smart system • Long warranties • Standardised specification • Message prioritisation / traffic management • Be easy to install and connect to the network • Lifetime of at least 20 years • Standardisation with other EU environments • Keep tariffs away from the meter as this makes it much more complicated

[8] Later workshops raised strong concerns around including remote disconnection capability, as it requires significant cryptographic protection to secure this capability against malicious usage (or misadventure). The cost of including this functionality may be high and the usage is likely to be low, as disconnection is expected to be used very infrequently and could be done locally, as it currently is with traditional meters.

[9] 'Last Gasp' is the ability of the smart metering system to send an alert that the power supply has been cut, enabling network operators to identify power cuts when significant numbers arrive simultaneously. This can be accompanied by 'First Breath' which sends an alert to notify that power has been restored.

• Real time energy use monitoring	
Could Have	**Won't Have**
• In-home displays (ensuring that an app-based solution is available if an IHD is not provided) • Ability to control smart devices via tariffs (e.g. EV charging restricted to hours of the day) • Secure Home Area Network (HAN) for smart devices • Ability to 'throttle' power to the home to support network demands / management • Customer prediction on cost if they switch to an alternative tariff • Ability to use smart meter for fire detection (used in Finland)	• The smart metering solution won't have world leading functionality • The solution must avoid vendor lock-in

In addition to this there were several different items discussed, which included:

- There was discussion around whether **physical in-home displays** would be needed or an app / website approach would be sufficient so IHD features both in the 'Must' and 'Could' have. Attendees thought app / website would be the primary approach but IHDs should be provided for consumers that are not digitally engaged. However, there is a cost associated with IHDs that needs to be assessed.
- Strong support for a **centralised approach** to data and maintaining the **shared services model**. One suggestion to look at the EU model for data access.
- The ability for stakeholders to access **anonymised data** is important, ideally enriched data with, for example, EPC data.
- It was emphasised that the smart meter functionality needs to, at a minimum, deliver the **existing keypad functionality.**
- **Future proofing is key:** particularly important on the communications side. The lifecycle is ~20 years but it's likely existing communications systems (e.g., 5G) may be retired in that time. An option to consider for telecoms solution is potential Long Term Evolution (LTE, a standard for wireless data transmission) development, alternative communications methods such as leveraging Fibre to the Premises, or Power Line Communications.
- From an ROI perspective, engagement highlighted that some stakeholders **would not been keen on a 'thin' smart meter solution**, particularly for keypad customers given how keypad currently works in Northern Ireland. This is a stark contrast to findings as discussed in Section 5: Data, where instead there were **numerous concerns with a 'thick' smart meter solution**.
- Features needed to gain customer benefits include digital customer interface, simple customer checks between bill data and what the meter says, the ability to easily assess whether ToU tariffs are beneficial and clear messaging on environmental and cost benefits.

- There was a **concern raised over the responsibility for disconnection**, need to carefully consider any implications of changes to the processes.
- The key learnings from other roll-outs include challenges around communication (2G, 3G), avoiding vendor-lock in where possible, ensuring robust data governance is agreed upfront.
- There was also a recommendation to ensure that the smart meter solution chosen is sufficiently waterproof for meters outside the property. There have been some issues with water damage due to water cupboard leaks in other rollouts.

Note that DESNZ is consulting this month on new standards for smart appliances which can remotely control electrical load. Delivering a smart and secure electricity system: implementation - GOV.UK (www.gov.uk).

6.3. Options Identification

6.3.1. Smart Meters: 'Thick' or 'Thin'

When determining the functional and technical requirements for smart meters, it is essential to consider the different models available, particularly the need for thick and thin smart meter models. The choice between these models has some major implications for the rollout strategy, infrastructure requirements, and overall consumer experience. Here is an overview of the key options:

- **Thick Smart Meter Models –** These are equipped with substantial processing power and memory, enabling them to perform complex functions independently. They can execute advanced energy management tasks. They require significant amounts of information to be sent to them to perform these calculations.
- **Thin Smart Meter Models –** These meters rely more heavily on centralised data management systems for processing and storage. They collect consumption data, and generate alerts, etc. and communicate them to a central system, which then handles more complex processing and data storage tasks.

6.3.2. Bespoke or Off-the-Shelf

Selecting between bespoke and off-the-shelf smart meters and systems is pivotal for early consideration in the rollout plans as this will impact the cost and scalability of the solution. Here is a breakdown of these key options:

- **Bespoke Smart Meters and Systems –** Bespoke solutions are tailor-made to meet specific requirements, offering flexibility and customisation options to address unique needs in Northern Ireland. They involve the development of custom hardware and software solutions, designed to integrate seamlessly with existing infrastructure and meet regulatory standards.
- **Off-the-Shelf Smart Meters and Systems –** These solutions are pre-built and readily available for deployment, offering standardised features and functionalities. These systems are typically mass-produced by manufacturers and offer cost-effective solutions with proven reliability. They may lack the customisation options of bespoke solutions but provide rapid deployment and scalability advantages.

6.3.3. Communications Systems and Signals

Determining the most suitable communication system and signal type for the smart meter rollout is crucial to ensure reliable data transmission, cost-effectiveness, and ease of implementation.

The main communication options include radio frequency (RF), broadband, and other alternative technologies, each with distinct characteristics and implications for the rollout. Here's an overview of these key options:

- **Wide Area Network (WAN) –** This is a telecommunications network that extends over large geographic areas, connecting smaller local area networks (LANs). In smart meter rollouts, WAN communications facilitate data transmission from individual meters to central systems, utilising technologies like mobile networks, private radio frequency, power line communication, and broadband, ensuring efficient monitoring, billing, and analysis over long distances. There are several different options for WAN communications:
  - Commercial Mobile Networks which use existing cellular infrastructure to transmit data and they can utilise various generations of mobile technology (e.g. 4G, 5G).
  - Private Radio Frequency (RF) can be established by Distribution Network Operators (DNOs) for smart grid applications.
  - Power Line Communication (PLC) that transmits data over existing electrical power lines.
  - Broadband (Fibre to the Premises (FTTP) or Fibre to the Cabinet (FTTC)), which uses high-speed fibre optic connections for data transmission.
- **Home Area Network (HAN) –** This is a local network within a home that connects smart devices, including smart meters, appliances, and in-home displays. In smart meter rollouts, HAN communications enable real-time data exchange between the smart meter and household devices, using technologies such as ZigBee, Wi-Fi, or Bluetooth, facilitating energy management, monitoring, and user interaction within the home.

6.3.4. Other Aspects

There are several other areas that must be considered when discussing the functional and technical requirements. These include:

- Addressing the diverse needs of different consumer segments. In the Northern Ireland context, pre-payment functionalities need to meet the specific needs of users, including flexible payment options, real-time balance updates, and budgeting tools.
- In-Home Display (IHD) requirements and therefore the provision of personalised energy usage insights, real-time consumption data, and interactive interfaces is another consideration to make for smart meters technical and functional requirements.

6.4. Options Assessment

For each category and option defined in section 6.3, we have assessed the pros and cons for each possible consideration. These are defined below.

Table 5: Options Assessment for Smart Meter Functional and Technical Requirements – This includes an assessment of the pros and cons of each option considered in section 6.3.

Option	Pros	Cons
Thick Smart Meter	• Robust processing capabilities and significant storage capacity for local data processing and storage.	• May require more frequent software updates and maintenance.

Option	Pros	Cons
	• Can offer immediate feedback to customers.	• Local storage increases the risk of physical tampering. • More costly versus thin smart meters. • More complex operation, and maintaining information such as tariffs can be problematic
Thin Smart Meter	• Simplified meter design. • A simpler meter, with more functionality provided centrally can reduce meter firmware updates and simplify software updates and data management. • Centralised data processing can facilitate stringent security protocols and centralised control over data access. • Generally lower cost, and lower maintenance required. • Simpler to ensure smart meter does not become obsolete and reaches end of economic life.	• Fewer immediate insights but these can be provided through an app or online portal.
Bespoke meters and systems	• Offer extensive customisation options to meet unique requirements, ensuring optimal functionality and integration with existing infrastructure. • Scalability depends on the underlying design and architecture, with the potential for seamless expansion and integration with future technologies.	• Involve higher upfront costs and longer development times. • Greater risk of technical issues. • Require thorough testing and validation to ensure compliance with regulatory standards, which may prolong the development process.
Off-the-shelf meters and systems	• Rapid deployment and cost-effective solutions. • Provide proven reliability and performance based on standardised designs, minimising the risk of technical issues – likely	• Limited customisation. • More limited compatibility with future technologies.

Option	Pros	Cons
	to be able to select meters and systems proven elsewhere. • Offer scalability through modular designs and compatibility with industry standards. • Typically come with pre-certifications and compliance with industry regulations, streamlining the approval process and ensuring regulatory compliance.	
WAN Communication	• **Commercial Mobile Networks:** Offer extensive coverage, high reliability with the latest mobile technologies. However, coverage may be limited in remote or rural areas. Utilises existing cellular infrastructure, minimising additional costs. • **Private Radio Frequency (RF):** Ensures dedicated network reliability and security. Offers long-term control and potentially lower operational costs. • **Power Line Communication (PLC):** Reliable in areas with robust electrical infrastructure, utilising existing assets. • **Broadband (FTTP):** Highly reliable and capable of handling large data volumes. Long-term solution and scalability. Benefits from existing internet security protocols. May be able to piggy-back on existing FTTP rollout.	• **Commercial Mobile Networks:** Coverage may be limited in remote or rural areas. Long-term operational costs for data transmission need consideration. Data transmission over public networks poses potential privacy risks. Approximate 10-year lifetime of each generation (e.g. 3G, 4G) • **Private Radio Frequency (RF):** Requires significant investment in infrastructure. • **Power Line Communication (PLC):** Can be affected by electrical noise and the quality of the power grid. • **Broadband (FTTP):** Deployment is limited to areas with existing fibre optic infrastructure but expanding rapidly.
HAN Communication	• Offers good coverage within the home, often with little interference. • Depending on current home infrastructure, it has the potential to be a low-cost solution. • Typically, highly secure with encryption and can be scalable.	• May require multiple nodes for longer distances to ensure reliable communication. • Wi-Fi solutions can be hacked if not properly secured.

Option	Pros	Cons
IHDs	• Provide real-time energy consumption data which can lead to more energy saving behaviours. • User-friendly, with intuitive interfaces that make it easy for consumers to monitor consumption. • IHDs can educate consumers about their energy usage patterns. • IHDs can integrate with pre-payment systems, providing users with up-to-date information on their balance and remaining credit. • Transparent and accessible energy data can enhance consumer satisfaction.	• Adds to the overall cost of the smart metering program. • Can present technical challenges, such as ensuring compatibility and reliable data transmission. • Increased maintenance and support to ensure they function correctly. • Consumers may misinterpret the data presented by IHDs, leading to confusion. • Can be a novelty for many consumers and quickly unused.

6.5. Recommendations

Based on our analysis and consideration of the various options for the functional and technical requirements, we have several strategic recommendations. Each recommendation is supported by the detailed analysis completed as part of this project. Our recommendations include:

- Designing bespoke systems and meters, the cost of which would have to be recovered from the small population base of the Northern Ireland roll-out (or through non-smart metering mechanism) would put the delivery of the CBA at risk. Therefore, we recommend using **tried and tested, off the shelf meters and systems.**
- **Meter and system requirements should be developed to ensure that the benefits identified in the CBA can be delivered** but they may need to be refined to de-risk the roll-out to enable selection of proven solutions, in line with the above recommendation. At this stage, there is a need to set out broad functionality areas. In particular:
  - We propose that known interoperable meters and systems should be selected to de-risk the roll-out (reduce the time, cost, and effort) meaning the requirements and benefits may need to be tempered.
  - Central systems requirements and data use cases will need to be mapped to meter requirements.
  - Effective governance is required to ensure requirements meet the needs of all stakeholders including suppliers and consumers.
  - The functionality defined should be based on achieving the benefits set out in the CBA.
  - The organisation responsible for procuring meters should define meter requirements that deliver the smart metering benefits in the CBA.
- **Remote disablement needs to be carefully considered in the rollout plan.** The cost benefit from introducing this functionality must be considered if the number of disconnections is extremely low in Northern Ireland since it may be more efficient to send out an engineer to disconnect meters.
- Northern Ireland has a high proportion of prepay customers and **smart meters must be at least as smart as existing prepay solutions** to ensure that consumers are willing to replace existing meters.
- We recommend **designing in proper network management and message prioritisation** to the central systems. The system must be able to prioritise delivery of certain messages and ensure timely delivery at the expense of non-time critical messages when the system is supporting high levels of traffic. Users should not have to adjust their business processes to work our network management issues.
- **As few suppliers / technology permutations should be introduced as possible** in the Northern Ireland rollout. Increasing the number of combinations will increase the complexity of the rollout and introduce additional expense and, as seen in GB, presents a greater risk of high volumes of meters not working.
- **DfE may wish to consider the inclusion of IHDs in the technical requirements of smart meters**. IHDs add cost to the meters and there is often a low level of usage, although Citizens Advice have reported a rise in usage in Great Britain over recent years. If a solution is presented without an IHD, there is a greater need for consumer apps to display the same information.

- There are several possible means for communication that should be considered and at a high level there is not enough information to recommend one form of communication over the others. **DfE should consider the form of communication further for the technical and functional requirements.**
- Stakeholder engagement highlighted that telecommunications copper will be replaced by fibre technology. This could increase efficiencies of the rollout by ensuring the rollout works off the back of the fibre rollout with both rollouts accessing properties at the same time. This may reduce the rollout cost and it will reduce the disruption to the consumer if access to properties is completed with the fibre installation. Stakeholders commented that based on the high fibre rollout in NI it looked like an attractive option for the communications. **NIEN should engage meter manufacturers and telecommunications companies** to work out what form of communication it should consider for the rollout.
- **A user-friendly interface**, whether via an in-home display (IHD) or a mobile app**, is essential** to realise some of the benefits of smart metering. This ensures consumers can easily read and interpret their energy usage data, promoting better understanding and engagement with their energy consumption, and maximisation of benefits.
- **A thin smart meter infrastructure solution appears to be a stronger solution** for Northern Ireland due to a centralised data system and a simpler, cheaper, and quicker to change structure. However, there was concern over a thin smart meter solution, particularly for keypad customers given how keypad currently works in Northern Ireland.

  Further research should be completed to investigate how a thin smart meter can address concerns with keypad customers. DfE should be involved in setting policy on the meter requirements and then it should be the body taking forward procurement who will look at options available on the market and then also involve stakeholders in a co-design process.

7. Barriers to Consumer Buy-in

7.1. Introduction, Objectives, and Benefits

Addressing the barriers to gaining consumer buy-in for the smart meter rollout in Northern Ireland is critical to consider at the early stages of rollout design. Understanding and addressing these barriers are essential for ensuring the project's success through high levels of uptake and long-term sustainability. Identifying and mitigating these barriers:

- reduces the risk of consumer resistance, which can delay implementation, increase costs, and reduce the level of uptake from communities in Northern Ireland;
- ensures that consumers understand the benefits and functionality of the technology, thereby reducing misunderstandings and misinformation, and
- fosters trust and cooperation from the public, which are crucial for achieving widespread adoption and maximising the benefits of the rollout both to consumers and the electricity system in Northern Ireland.

This section outlines the key barriers to consumer buy-in that have been identified through literature reviews and a dedicated workshop on the topic. The insights and findings from this section will serve as a foundation for crafting key topics for discussion in DfE's consultations as well as a high-level roadmap development.

7.2. Evidence / Learnings

7.2.1. Learnings from Literature Review

GB has ongoing monitoring and evaluation of consumer benefits in place, but a comprehensive evaluation, including an assessment of the impacts on consumers and suppliers, is not planned until the rollout is completed. In 2022, a research study conducted by the Energy and Utilities Alliance on GB energy consumers revealed that over half of the surveyed households were unwilling to adopt a time-of-use (ToU) smart meter tariff. A separate survey conducted in 2021 also highlighted that GB consumers remained cautious about the smart meter rollout, with only around 40% of respondents believing that the multibillion-pound investment in the rollout has been worthwhile.

GB consumers have showed reluctance to adjust their energy usage patterns, especially regarding heating, as they would prioritise comfort over price considerations. The UK's House of Commons also expressed concerns about smart meters not delivering expected energy bill savings to consumers. Recent estimates from GB indicate modest savings due to smart meters, ranging from 3.3% to 3.6% for electricity and 2.9% to 3.1% for gas. These figures, while beneficial, may not be perceived as compelling enough to promote smart meters as a significant benefit for all consumers. For example, wealthier individuals are more likely than those with fewer financial resources to afford new appliances (such as white goods) if their smart meter suggests relatively high running costs of older appliances they may own (UK House of Commons, 2023). Additionally, there were reported instances of smart meter devices ceasing to function when consumers switched energy suppliers, which added an extra layer of caution for customers (Kirkman, 2022).

However, in a 2023 survey commissioned by Ofgem and Citizens Advice, it was found that around two-thirds of GB customers with smart meters were satisfied with their devices, particularly citing higher satisfaction with bill accuracy (Ofgem, Citizens Advice, BMG, 2024).

Furthermore, GB has identified other benefits of smart meters to provide more convenience and financial security for energy consumers. For example, smart pre-payment meters automatically received energy bill support payments over the winter of 2022-23, whereas those on traditional pre-payment meters needed to go through other processes to claim the financial support. During the same period (2022-23), the Demand Flexibility Service was launched, allowing consumers to receive incentives for shifting their consumption at peak demand. GB expects that flexibility services and ToU will become more widespread after the new half-hourly settlement arrangements in the retail electricity market go into full scale in 2025 (National Audit Office, 2023).

Reflecting on lessons learned from GB's experience, it is important to address consumer concerns and ensure that the benefits of smart meters are equitable and clearly communicated to all stakeholders. Immediate benefits, such as improved bill accuracy and the ability to access flexibility services, have generated positive sentiments in GB. However, ToU offerings often did not sufficiently motivate consumers to adopt smart meters, and they are more popular with people who own electric vehicles and other low-carbon technologies.

ESB Networks, acting on behalf of Irish regulators, conducts a quarterly national survey to gauge consumer sentiment towards smart meters. The survey targets 1,000 consumers who have yet to adopt a smart meter. The most recent survey results revealed that around 5% of respondents nationwide expressed negative sentiment towards smart meters, indicating a rejection of uptake. Notably, border counties reported a higher percentage of consumers with negative sentiment, surpassing the national average with 9-10%. A stakeholder also highlighted that one reason consumers resist smart meters is their comfort with traditional mechanical meters. These consumers are used to seeing their meter dial reverse when the microgeneration system is in use. Additionally, negative press and media coverage can influence consumer perceptions, leading to the belief that smart meters could result in higher bills and potentially allow for customers to be disconnected remotely without justification (Energia, 2023). We recommend below that this be mitigated against by having a proactive communication strategy to address potential negative press.

A more significant issue is that most consumers in Ireland have not yet adopted smart tariffs. In 2022, only 4% of Irish consumers adopted Time-of-Use tariffs. By 2024, just about 9.7% of residential Irish consumers, which is over 150,000, have switched to smart tariffs. Approximately 146,000 others are accessing their data through a customer portal (ESB Networks online account) but have not utilised it to find a smart deal that best suits their electricity usage (Irish Independent, 2024). Some suppliers have not been very proactive in communicating the availability of smart tariffs to consumers, despite being obligated to engage with consumers a year after the installation of a smart meter at a consumer's premises, as outlined in the Suppliers' Handbook (CRU, 2023).

Most of the first-generation (Gen1) smart meters in Italy were voluntarily installed by Italy's largest Distribution System Operator (DSO), e-Distribuzione (European Commission, 2014). Although using a voluntary approach, Gen1 rollout in Italy did not face any significant resistance from the consumers. This could be since smart meters were promoted as devices that enable faster connection (supply) once an energy contract has been established. Consumers were also informed with how Gen1 smart meters can provide "minimum vital services" (also known as "social available power") to vulnerable customers, allowing these customers to maintain a minimum power supply for essential electricity usage for a certain period before stronger interventions (such as disconnection) are implemented (ARERA, 2019). Furthermore, Italy did

not encounter significant resistance from consumers regarding the rollout of Gen2 smart meters, as it is mandatory and regulated by law (ARERA, 2023).

7.2.2. Learnings from Stakeholder Engagement

Stakeholder engagement highlighted numerous learnings which should be considered by DfE in gaining consumer buy-in. This includes:

- Primary barriers to gaining consumer buy-in:
  - Many customers are reluctant to get a smart meter as they **distrust suppliers or the meter itself**, worried by the possibility of 'surge pricing' and switches without their consent for example. **Highlighting the benefits of smart meters** to customers is extremely important as this builds trust and understanding.
  - Implementation can **disrupt all customers** including small businesses which can be impacted more than individual customers through the installation process, emphasising the need to address their specific concerns. Additionally, smart meters will provide insights businesses need. There is a need to position them as something positive for businesses.
  - For the NI context, it must be **at least as good as key-pad meters** otherwise challenging to get customer buy-in for a solution that does not benefit them.
- How can barriers to buy-in be overcome:
  - **Communicating the costs** associated with the rollout and **who bears them is essential**. Government / regulator involvement in messaging creation, along with industry support, can ensure transparency and alleviate concerns about financial implications.
  - Customers need to see the advantages of smart meters early on, with **data made available** almost in real-time.
  - **Tailored engagement** with customers is required to get buy-in at higher level. Customers interact with energy in diverse ways, it is crucial to engage them through familiar channels and experiences, such as digital portals, to provide the insights they need.
  - **Timeliness (between booking and installation) is crucial** - delays may lead to decreased customer interest and higher abandonment rates.
  - Adopting an infrastructure rollout mindset, akin to other large-scale projects, may not prioritise customer needs which will lead to lower levels of buy-in. **Customers must be the priority in the rollout.**
  - Ensuring **transparency** in rollout programs and communicating installation timelines can help manage customer expectations.
  - **Recognising social implications** of smart meter adoption, particularly among tech-savvy individuals, can influence acceptance and engagement.
  - Identifying **priority groups** based on motivations, such as those using pre-payment meters, can tailor messaging and incentives to specific needs.
  - By considering the range of consumer types in the approach to communication, including non-domestic customers. For example, engagement revealed concerns about the implications of smart meters on the agricultural sector. These concerns included higher bills, rural connectivity issues, cyber security concerns and remote disconnection. Tailored communications can help alleviate these concerns. The

concerns of the agricultural sector could be mitigated against this by, for example, use of renewables, battery storage and consideration of a TOU tariff for different types of businesses.

- Roles and responsibilities:
  - Recognising the need that **communication of benefits does not solely rest with suppliers**, but involves input from various stakeholders **in a coordinated approach**, such as brands fostering trust and industry regulators.
  - An **independent authority**, like the Sustainable Energy Authority, is crucial for providing impartial advice and ensuring clarity on benefits beyond just eliminating the estimated bills in NI.
- Monitoring and support for consumers:
  - There needs to be **sufficient support** for customers for devices that have stopped working, this is a key learning from the GB rollout.
  - Establishing a **centralised database** to track installation progress and understand customer journeys can improve communication and transparency throughout the rollout process.
- **Past rollout experiences** can offer valuable insights into best practices and potential pitfalls to avoid.

7.3. Options Identification and Appraisal

To address consumer buy-in concerns, several key aspects must be considered for effective engagement and management of consumers. This section outlines the critical options that need to be evaluated to overcome the challenges previously identified in this report, emphasising their importance in securing consumer buy-in.

7.3.1. Customer Experience

Ensuring a positive customer experience is crucial for the successful rollout of smart meters and it can be broadly divided into three interconnected aspects, each playing a vital role in consumer satisfaction and buy-in for the rollout of metering infrastructure:

- **Initial Engagement:** This phase involves the first interaction consumers have with information about the smart meter rollout. This part is essential to communicate clearly and effectively, highlighting the benefits and addressing any potential concerns early on.
- **Installation Process:** This aspect covers the entire journey from planning the installation to the actual installation and setup of smart meters for each customer. Effective customer engagement during this phase ensures that installations are smooth and convenient, fostering a positive experience.
- **Post Installation:** After the smart meters are installed, ongoing support is crucial. This includes monitoring the benefits of the new system, helping customers overcome any challenges, and providing continuous advice and support to maximise the smart meter's potential.

Given the interlinked nature of these aspects, it is paramount that consumers have a positive experience throughout each stage. This comprehensive approach to customer experience will help ensure the success of the smart meter rollout by building trust, satisfaction, and long-term engagement.

Initial Engagement

The initial engagement phase is critical as it shapes consumers' first impressions of the smart meter rollout. As part of our research there are several key considerations that need to be made during this phase to ensure that there is effective communication and a positive reception from consumers. This includes:

1. **A centralised resource for customer enquiries –** Providing a centralised resource for customer enquiries is important and it would ensure that consumers can easily find accurate information and get their questions answered promptly. This has been a problem with other smart meter rollouts, such as GB, where consumers get passed between different stakeholders at different points of their journey. This creates challenges with answering questions and at the post installation stage with rectifying issues with faulty smart meters whereby no stakeholder will take responsibility for addressing questions or concerns. This ultimately creates a rise in distrust of the rollout process at the beginning which will ultimately remain throughout the process.
2. **Benefits of smart meters need to be made clear from the start –** Clearly communicating the advantages of smart meters from the outset is crucial to help consumers see the value in adopting the new technology, in turn increasing their willingness to participate in the rollout. This can be done through several means and prioritised by consumer groups, which is discussed in the following section in greater detail.
3. **Identifying and promoting champions –** individuals or groups who are enthusiastic about smart meters can significantly boost engagement. These champions can share their positive experiences and advocate for the benefits, which helps to build momentum and trust among other consumers.

Installation Process

The installation phase is a pivotal part of the customer journey, as this could be the first direct interaction a lot of consumers have with those stakeholders conducting the rollout. The experience includes planning the installation to the actual installation and setup of smart meters. Several key considerations need to be made during this phase to ensure a smooth and positive experience:

4. **Regular communication –** Maintaining regular communication with customers throughout the installation process is crucial. This helps keep them informed about the installation schedule, what to expect, and any necessary preparations, therefore reducing uncertainty and increasing consumer satisfaction with the process.
5. **Easy ability to schedule installation –** Providing an easy and flexible scheduling system for installations is key. This convenience allows customers to choose times that best fit their schedules, reducing inconvenience, and increasing cooperation. This could be done through a platform where customers register and organise, or alternatively, for stakeholders to reach out directly.
6. **Quick, easy, and hassle-free installation process –** This is perhaps the most important aspect for the installation process to ensure consumer satisfaction. A streamlined installation minimises disruption to customers' daily lives and leaves them with a positive impression of the smart meter rollout. If the installation process becomes drawn out or challenging, particularly in the initial stages of the rollout, then there will be increased reluctance for consumers in later stages of the rollout to engage in the rollout.
7. **Aligned approach across industry (NIEN and suppliers) –** An aligned approach between Northern Ireland Electricity Networks (NIEN) and suppliers ensures a consistent and coordinated installation process. This alignment minimises confusion of consumers, enhances efficiency, and ensures that customers receive a unified message and service experience.
8. **Smart tariffs and benefits available at the same time as install –** Offering smart tariffs and benefits simultaneously with the installation provides immediate value to customers. This immediate access to new smart tariffs and savings reinforces the benefits of the smart meters and encourages positive engagement experiences. However, it might be beneficial

to follow up with a customer after a certain period when there is information about their usage so that a suitable smart tariff can be recommended.

9. **The installation can be used to explain all meter functionality, options for maximising benefits and identifying and vulnerabilities –** This important consideration ensures that consumers understand how to use the smart meters and that any special needs are addressed, promoting safety and effective use to ensure benefits to the consumer can be maximised. It also allows consumers to raise questions about smart meters to help them become comfortable with the new technology.
10. **The metering system must work –** Ensuring that the smart meter system works correctly upon installation is crucial and is a challenge which was highlighted in the GB smart meter rollout. Ensuring meters are working straight away will directly lead to higher satisfaction of consumer groups and greater levels of engagement.

Post Installation

The post-installation phase is critical for reinforcing the value of smart meters and ensuring longer-term customer satisfaction. Several key considerations need to be made during this phase to support customers effectively, including:

11. **The availability of a helpdesk –** Establishing a robust helpdesk that includes the option to speak directly to a representative and receive impartial advice needs to be a consideration made to ensure consumers receive reliable support to address any issues or questions they may have. Similarly, offering prompt and easily scheduled fixes if issues arise is vital. These aspects ensure the continued satisfaction and confidence in the smart meter system.
12. **Advice on new smart-enabled products and services –** Continuous interaction and updates help customers maximise the benefits of their smart meters and helps them stay updated on new opportunities for maximising benefits.
13. **Ability to see their data and energy saving info –** Giving customers easy access to their data and energy-saving information in an engaging data visualisation tool or app empowers them to make informed and actionable decisions about their energy usage. This addresses a key barrier identified in the RoI smart meter rollout, where only customers who signed up to smart tariffs could access their data. This transparency and accessibility encourage proactive energy management and enhance overall customer satisfaction. In addition to this, allowing customers to compare their energy usage to similar homes provides valuable context. This feature is important as it helps customers understand their consumption patterns and identify areas for improvement, promoting energy efficiency and the maximisation of smart meter benefits.
14. **Transparency on bills –** Ensuring transparency and simplicity is important for building trust with customers. Clear and understandable billing practices help customers see the direct impact of their smart meter usage, fostering trust and satisfaction with the new system.

7.3.2. Engagement

A well-defined engagement strategy is essential for gaining consumer buy-in, and ultimately the success of the smart meter rollout. The responsibility for engagement with consumers is discussed in more detail in Section 3: Roles and Responsibilities. Different approaches can be considered here, such as oversight by a single stakeholder or a coordinated approach involving multiple parties targeting specific consumer groups. In particular, there some key elements of the communication to consumers that must be considered, and these are:

- **Timings of communication:** Timings of the communication to consumers can be completed at various points of the rollout. This can be separated into several different timings which may be combined to maximise impact:

  - **As Early as Possible in the Plan:** This ensures that they are informed and prepared for the upcoming changes. Early communication sets the foundation for understanding and buy-in, reducing uncertainty and resistance later in the process.
  - **When Stakeholders are Aligned on Core Benefits:** This enables a unified message to be communicated to consumers. When all stakeholders are on the same page regarding the advantages of smart meters, communication efforts are more coherent and persuasive, enhancing consumer trust and receptiveness.
  - **Tailoring Communication for Different Customer Segments:** Different customer segments may have varying needs, therefore is key to time communication appropriately for each group. Engagement from trusted organisations and involvement from local community groups can help tailor messaging and timing to resonate with specific demographics, ensuring relevance and effectiveness. This engagement can facilitate the dissemination of information to diverse consumer segments, maximising outreach and engagement.
- **Communication delivery method:** Several different approaches can be made to deliver communication to various consumers. This includes communication via digital and traditional means. Additionally, a combination approach can be outlined which considers various variables to deliver a tailored approach for various consumer groups.
  - **Digital channels**, such as email, social media, and mobile apps, offer the advantage of reaching a wide audience quickly and cost-effectively, making them ideal for tech-savvy consumers or those who prefer online interactions.
  - **Traditional means**, such as direct mail, newspapers, and community events, still hold value for reaching certain demographics, such as older adults or rural communities, who may not be as digitally connected.
  - Additionally, a **combination approach** can be outlined, considering various variables such as demographics, geographic location, and preferences, to deliver a tailored approach for different consumer groups.
  - Furthermore, there are **several consumer groups that should be considered** for the installation of smart meters. These are, advocates/loud community members, prepayment meter customers, high-consuming customers, low-income households. There are several groups that should be considered for consumer protection, which include: vulnerable customers, SMEs, and social housing providers.
- **Communication Contents:** This can include the articulation of the benefits and rollout plans from the outset. Key considerations for the communication contents should include:
  - **The use of case studies and profiles.** These would showcase the benefits of smart meters is an important engagement strategy. These real-life examples help consumers relate to the experiences of others and see the tangible advantages of adopting smart meters, reducing reluctance to participate.
  - **Providing online and offline guides and tutorials.** These resources cater to different preferences and learning styles, ensuring that all consumers, regardless of their preferred method of information consumption, can understand and utilise smart meters effectively.
  - **Share pictures or videos of the products.** Visual aids help demystify the technology, making communication easily digestible for consumers.

- **Offer specific information to help businesses prepare for the rollout.** The information for businesses may vary depending on the benefits applicable or the rollout strategy. Providing this information allows businesses to plan and integrate the new technology smoothly into their operations, and avoid disruptions.
- **Provide clarity on the funding mechanisms.** Transparency about who will bear the costs helps build trust and reduces uncertainty, addressing potential concerns about hidden charges or financial impacts. This clarity can enhance consumer confidence and willingness to engage with the smart meter rollout.

In addition to the above considerations, incorporating behavioural insights theory or engagement testing with personas into communications may enhance the effectiveness of engagement efforts. This workstream will help stakeholders understanding how consumers make decisions and what influences their behaviour. This will help tailor messages that resonate more deeply, encouraging positive responses and achieve higher adoption rates of smart meters.

7.3.3. Feedback Mechanisms

One key aspect that was identified during research was the need for sufficient support and a feedback mechanism. This was identified both through literature reviews and stakeholder engagement. Several different considerations that became apparent from the research, and they include:

- **Energy Insights App:** Utilise data-driven engagement tools to provide customers with personalised energy usage insights.
- **Portal/Database Access**: Develop a platform for customers and suppliers to track smart meter installation progress and understand their journey.
- **Customer Research:** Conduct research at each stage of the customer journey to gather insights and adapt strategies accordingly.
- **User Testing:** Implement user testing to ensure the usability and effectiveness of smart meter interfaces and support tools.
- **Compensation Mechanisms:** Establish compensation protocols for errors encountered during the rollout process to maintain trust and accountability.
- **Monitoring of media:** There was a recommendation to have a dedicated role to monitor the media on smart meters in Northern Ireland to support understanding of public perception. For example, this could consist of a daily news alert that produces a summary of the media mentioning ‘smart meters’.

The identified considerations are key to ensuring that consumers receive adequate assistance and have avenues for providing input and addressing concerns. By leveraging the above considerations, the rollout process can be enhanced to meet consumer needs effectively. These efforts collectively contribute to building trust, promoting accountability, and ensuring consumers have a positive experience throughout the customer journey.

7.4. Recommendations

Based on our analysis and consideration of the various options for the overcoming barriers to gaining consumer buy-in, we have several strategic recommendations. Each recommendation is supported by the detailed analysis completed as part of this project to ensure there is a consumer focus that adequately addresses all concerns raised by various stakeholders. Our recommendations include:

- A consumer focussed rollout is needed with consumer trust being a common issue that is encountered with metering rollouts. Highlighting the benefits to customers and who bears the cost of smart meters in a tailored, timely, and transparent approach is extremely important as this builds trust and understanding generally, and from priority groups that have been identified. Further, the total cost of and anticipated completion level of installation will be significantly impacted by the effectiveness of any consumer engagement campaign.
- However, it is important to **not make any false promises** from the outset (such as smart meters will save £XX per year). These messages could destroy credibility of the rollout and increase the distrust from consumers, resulting in negative impacts on the uptake and costs of the rollout. Savings are dependent on consumer behaviour, appropriate tariffs, and other factors.
- To foster trust, an **independent authority**, like Smart Energy GB is therefore essential for providing impartial advice and ensuring clarity on benefits beyond just eliminating the estimated bills in Northern Ireland.
- We recommend that the **communication of benefits does not solely rest with suppliers**, but involves input from various stakeholders **in a coordinated approach.** In particular, we recommend that the following stakeholders have the following roles in a coordinated approach:
  - Government – initial announcement
  - Consumer Council – public awareness campaign
  - NIEN and suppliers communicate benefits – overseen by UR
  - For business customers a business representative organisation should be used to communicate with customers.
- We recommend developing a **proactive communication strategy to address potential negative press**. This may include engagement with media outlets to correct misinformation, highlight success stories, and demonstrate transparency. This approach will help maintain consumer confidence, trust, and uptake throughout the rollout.
- **DfE should consider recognising social implications** of smart meter adoption, particularly among tech-savvy individuals, which can influence acceptance and engagement from consumers.
- **The customer engagement journey is essential to get right.** Considerations need to be made from initial contact through to installation / doorstep protocols and then long term customer engagement post installation.
- Customer engagement and installation process should minimise disruptions to the customer and **quick, easy and hassle free, with smart tariff information and benefits available at the same time as install.** There should be an ability to easily schedule installations and works must be adequately explained to the customer. DfE should consider how it provides a centralised resource for customer enquiries to streamline this process.

- Engagement highlighted the **disruption for installations is more significant for small businesses** compared to domestic consumer so a focus should be on communicating benefits to businesses and addressing their disruption concerns.
- **Avoid the use of an implied mandated rollout and hard targets** as this will disengage consumers. Further discussion on this recommendation is provided in Section 8 – Rollout Strategy.
- **Smart meter data (and therefore benefits) must be made available immediately post installation**, including digital app showing engaging data visualisation and actionable insights. This should include the ability for consumers to see their data and energy saving information, as well as possess the ability to compare information to similar homes.
- **Ongoing support and advice are essential post-installation.** This will require support and advice on new smart-enable products and services, in addition to supporting consumers to fix devices that have stopped working. This can be done through a specific Helpdesk which includes the option to speak to someone, to receive advice.

8. Rollout Strategy

8.1. Introduction, Objectives and Benefits

The smart meter rollout strategy that is implemented in Northern Ireland is a critical factor to consider at early stages of rollout design. Having a robust rollout strategy for smart meter rollout offers numerous benefits that ensure the project's success and long-term sustainability. A well-planned strategy:

- minimises the risk of technical, logistical and cost challenges to ensure an efficient and timely implementation across Northern Ireland
- ensures that the technology works as intended from the moment of installation, therefore reducing the need for subsequent interventions
- enhances customer satisfaction by fostering trust and cooperation, both of which are crucial for overcoming resistance to widespread adoption.

This section outlines the key components of a comprehensive rollout strategy that has been developed through literature reviews and a dedicated workshop on the topic. The insights and findings from this section will serve as a foundation for crafting key topics for discussion in DfE's consultations as well as a high-level roadmap development.

8.2. Evidence / Learnings

8.2.1. Learnings from Literature Review

In GB, the rollout of smart meters is currently mandatory[10], although it is implemented with some flexibility. Customers have the option to refuse smart meters, but when their existing meters expire, they will be replaced with smart meters by default. However, customers can still choose to opt out of the 'smart' functionality of the smart meters or pay an extra charge for traditional meters if they prefer – given the supplier still has traditional metering equipment in stock (Casalis, 2024).

When first announced in 2008, GB initially mandated smart meter installations for energy suppliers (UK Energy Act, 2008). However, this mandate was removed in 2012, shifting to a requirement for suppliers to take 'all reasonable steps' to install smart meters (ClimateXChange, 2021). The change was made because the mandatory approach was anticipated to result in consumer resistance (UK DECC, 2012).

GB energy suppliers are rolling out smart meters regardless of the equipment age (i.e., an active rollout). Customers can request smart meters directly from their suppliers if they have not been offered a replacement yet, though they may need to wait for the installation programme to reach their area (Zero, 2023).

[10] 1The term 'Mandatory' here is based on Northern Ireland CBA definition that Smart Meters are installed in consumer premises on an opt-out basis. The prevailing assumption is that consumers accept their installation and only those that expressly choose not to are excluded from the programme. The provision of an opt-out process should be considered further but at a high level might reflect a notification to the Consumer ahead of installation and an opportunity for the Consumer to decline.

In the Republic of Ireland, ESB Networks is conducting the rollout on a regional (area-by-area) basis. All customers are automatically included for smart meter installation but are given the freedom to opt-out at the time of the offer by informing ESB Networks directly (The Ultimate Guide to Smart Meters in Ireland, 2024). However, eventually consumers are required to change into smart meters once their existing meter's certification expires. Additionally, customers who want to be prioritised for the rollout can notify either ESB Networks or their energy supplier.

In Phase 1 (2019-2020), the rollout was prioritised for old equipment. Now, ESB Networks is replacing traditional meters regardless of the equipment age, as the aim is to replace all traditional meters by the end of 2024. Until recently, smart meter replacement was focused for standard 24-h electricity meters. Since September 2023, Day/Night meters with two registers and unused Night Storage Heating meters are also being replaced. 3-phase smart meters will be rolled out in 2025.

In Italy, the Gen1 rollout was done on an active basis by Enel Distribuzione. After ARERA's mandate, other DSOs also started Gen1 rollout on an active basis. e-Distribuzione began the Gen2 (Open Meter) rollout around a decade after completing the Gen1 rollout.

From these rollout strategies, there are several learnings:

- In GB there were several learnings. This included a low uptake in some areas including more remote areas and some local authorities in London with reasons unclear. Potential factors could include limitations in accessing communication networks, availability of installers, and consumer trust / engagement issues from various demographics. Furthermore, reporting on the GB smart meter rollout has observed that DESNZ could have done more to support the engagement with consumers, which was mainly delivered by Smart Energy GB (a nonprofit funded by suppliers). Increased engagement should encourage behaviour change and increased adoption.
- In the Republic of Ireland some customers reported issue with faulty meters contributing to an increase in their bills. One success was that external funding was provided. The European Investment Bank backing the Republic of Ireland smart meter rollout with €150 million , which is equal to around 40% of the projected total costs.
- In Italy, a key learning was that the rollout strategy should be adjusted based on the existing energy market. There is a need to understand that there is no one-size-fits-all solution and tailoring of the smart metering system design to the country's unique conditions and goals should happen. Furthermore, Italy's first mover advantage resulted in a new challenge to replace Gen1 smart meters with Gen2. To justify the replacement cost, Italy defined additional functional requirements for Gen2 and a specific tariff regulation based to support DSOs with Gen2 installation (ARERA 646/2016). (Piti A. e., 2016)

8.2.2. Learnings from Stakeholder Engagement

Stakeholder engagement highlighted numerous learnings which should be considered by DfE in the smart meter rollout strategy. This includes:

- Learnings from the rollout approach:
  - A combination of an 'active' and 'opt-out' rollout approach emerged as the most popular choice; however, further considerations need careful assessment to come to a final conclusion on the approach that should be taken. This should include cost recovery, geographic distribution, and potential customer disengagement.

  - Communication of the rollout strategy should be carefully considered and the use of the term “mandatory” (as defined above) should be avoided as this implies there will be penalties if customers do not want to participate.
  - Leveraging other initiatives alongside smart meter installations, such as public sector requirements for insulation or supporting fuel-poor customers with additional services like photovoltaic installations, can maximise benefits, increase efficiency and support broader societal goals.
  - The supplier led rollout in GB continues to suffer from relatively low engagement but a network led rollout could have greater challenges (when it comes to customers understanding the true benefit). Smart Energy GB campaign fell significantly short of engaging the population on the benefits of smart and the lack of tariff innovation by the industry compounded this. Energy Supply historically has low engagement and low trust from consumers. Smart meters are benefit enablers for customers, not a benefit on their own.
- Learnings from prioritisation discussions:
  - The need to recognise the diversity of customers and Northern Ireland specific considerations, particularly fuel-poor households or areas with communication challenges needs to be made. This suggests the need for tailored approaches to implementation. The experience from NIEN and suppliers can inform the tailored approach.
  - There are pre-existing areas in Northern Ireland where the meters are already at their end of life but cannot be accessed. Although this is not specifically a smart metering issue, it may present some economic and logistical challenges during the rollout and therefore should be considered.
  - While there is a large proportion of outdoor meters compared to GB, this should not be considered as a meter exchange opportunity without the need to engage consumers as this will not drive behavioural change to deliver the benefits that smart metering enables. Additionally, care will be required when disconnecting vulnerable consumers.
  - Prepayment customers, often associated with keypad meters, should not be treated as a secondary group in Northern Ireland due to the high uptake of pre-paid meters.
- Learnings from preventing delays and cost overruns, including mechanisms for monitoring progress:
  - As more customers transition, there is a need to support legacy arrangements, particularly for prepayment meters. However, maintaining infrastructure for a decreasing number of customers can pose cost challenges.
  - One of the potential benefits of smart meters for consumers and the energy system is the ability for customers to take up ToU tariffs to use electricity when it is cheapest and greenest. A simple solution, providing suppliers with sufficient data and meeting data privacy needs is required to make this a reality.
  - Setting achievable targets, rather than aiming for 100% completion immediately, can mitigate the risk of cost overruns and delays, ensuring more manageable expectations.
  - Providing adequate training for installers is crucial to prevent inadequate installations. Ensure there is a team of people able to ‘handhold’ less-savvy customers through the process.

- Implementing a portal or system to see where customers are in the journey and identify incomplete installations can help identify and address issues promptly, reducing the risk of delays and ensuring the effectiveness of the rollout.
- Quality over quantity metrics: While the number of installed meters is a key performance indicator (KPI), it is noted that simply having an installed meter does not guarantee functionality. Therefore, there is a need for additional performance metrics beyond installation numbers.
- Debate on whether systems should be fully ready before installations begin or if readiness should be staged alongside installations. Quick wins, like those seen with Scottish and Southern Electricity Networks (SSEN)'s Open Data Portal, can inform this approach.
- Monitoring customer demand reduction and assessing whether customers feel they are better off are vital aspects of evaluating the rollout's success and its impact on consumers. However, with increasing electrification, attempting to assess energy reduction will be misleading.

- Project participants:
  - The level of active or passive rollout will determine the number of contractors needed for installations and therefore the need for a specific third-party PMC (Project Management Consultancy).
  - The successful arrangement for retail market opening in Northern Ireland involved NIEN leading with supplier involvement and a steering group. It is emphasised that governance should not be overly burdensome.
  - Branding and communication are essential to convey that the rollout marks the beginning of a transition, setting appropriate expectations for customers.

8.3. Options Identification

8.3.1. Rollout Approach

The rollout approach is classified into two main categories: 'opt-out' and 'opt-in', with further distinctions made between an active or passive rollout. Here's a breakdown of each approach:

- **Opt-Out Approach –** This model involves the installation of smart meters in consumer premises by default unless consumers actively choose to opt-out.
- **Opt-In Approach –** In contrast to the opt-out approach, the opt-in approach is consumer-driven. Smart meters are installed only in premises where consumers expressly request them. This approach prioritises consumer choice and autonomy in the adoption of smart meter technology.
- **Active Rollout –** An active rollout strategy involves the systematic installation of smart meters according to a managed plan, typically at an accelerated pace. Under this approach, the replacement of existing meters occurs swiftly, regardless of the condition of the current meter.
- **Passive Rollout –** In a passive rollout, the incumbent meter is replaced with a smart meter only when the former reaches the end of its operational life. This approach ensures that smart meters are introduced gradually, as existing meters naturally require replacement due to aging or obsolescence.

These categorisations provide a high-level framework for decision-making regarding the approach to smart meter rollout. The selection of the most suitable approach between these

options depends on various considerations, including regulatory requirements, consumer engagement strategies, and infrastructure readiness. Similarly, it is possible to consider elements of each category defined above to provide a more bespoke rollout approach.

8.3.2. Prioritisation

Prioritisation is another key area that must be considered when developing the rollout strategy and developing targets. There are various options available for determining the order in which smart meter rollout occurs and these can be broadly categorised as follows:

- **Consumer Segment:** One option is to prioritise rollout based on consumer segments. This approach involves targeting specific groups of consumers, such as residential households, businesses, or vulnerable populations, for earlier installation of smart meters.
- **Geographical:** Another option is to prioritise rollout based on geographical considerations. This approach involves identifying regions or areas where smart meter deployment would yield the greatest benefits or where there is a pressing need for infrastructure upgrades.
- **Immediate Benefit:** Prioritising based on immediate benefits focuses on deploying smart meters in locations where they can deliver immediate value to customers or the electricity system. This could include areas experiencing high energy consumption, or regions where there is a strong demand for energy-saving initiatives.
- **Meter Types:** Another option is to prioritise rollout based on meter types. This approach involves targeting specific types of meters, such as outdated or malfunctioning meters, single phase ahead of poly phase meters, credit ahead of prepayment, for replacement with smart meters.
- **No Prioritisation:** Alternatively, a decision can be made not to prioritise rollout based on any specific criteria. In this approach, smart meters are deployed in a more uniform (i.e., tackling all areas and groups simultaneously) or random manner.

It is likely that for operational reasons that there will be no strict adherence to any defined strategy, and that a mixture of strategies will be the eventual outcome.

8.3.3. Engagement with Consumers

As discussed in Section 3: Roles and Responsibilities, Section 4: Consumer Protection, and Section 7: Barriers to Consumer Buy-in, the engagement with consumers is key to communicate benefits from the rollout and ensure there is sufficient support for the rollout. This is particularly important to help define the rollout strategy and to maximise its benefits. Further discussion on the engagement with consumers is outlined in more detail in Sections 3, 4, and 7 of this report.

8.4. Options Assessment

For each category and option defined in section 8.3, we have assessed the pros and cons for each possible consideration. These are defined below.

Table 6: Options Assessment for Smart Meter Rollout Strategy – This includes an assessment of the pros and cons of each option considered in section 8.3.

Option	Description	Pros	Cons	Notes
Rollout Approach	Opt-Out Approach	• Greater penetration of	• The rollout risks becoming a meter	•

	customers at faster rate. • Faster and greater realisation of benefits. • Does not need to be presented to the customer as a “mandatory” rollout.	swapping exercise. • Northern Ireland specific cultural and political considerations need to be navigated. • Potential customer reluctance.	
Opt-In Approach	• Consumers are given choice. • Encourages consumer engagement and propositions which increases engagement.	• The rollout is not guaranteed to be completed. • Possible low uptake will not justify capital costs for the programme. • Greater coordination is required (i.e., offerings, engagement etc.)	•
Active	• Faster adoption. • Increased efficiency of delivery. Can be done on a street-by-street basis to increase rollout speed. • Benefits from the smart meters will be realised quicker. • Meets customers’ demands for a smart meter rather than waiting until meter end of life.	• Potential claims of unfairness that the rollout is not being applied to certain areas. • Lack of control from customers. • Cost of securing the resources required may be larger (i.e., paying a premium to contractors).	•
Passive	• Ability to spread the meter	• Inefficiencies in meter	•

		replacement costs over time due to slower rollout. • Enables time for trials and learnings to be incorporated into rollout. • Increased environmental consideration and better value for money for existing and working legacy meters.	installations possible. • Increased time, and cost, to manage legacy meters. Creates difficulties for suppliers managing bills due to complexities with multiple metering systems. • Longer amount of time is required to realise the benefits from the rollout.	
Prioritisation	Geographical prioritisation	• Resources are allocated efficiently and that areas with the most urgent requirements are addressed first. • Can be completed behind certain network constraints, enabling suppliers to offer demand turn up service/rewards.	• Possible it does not result in a just transition due to social economics in regions of Northern Ireland.	•
	Immediate benefit priority	• Maximises the impact of smart meter deployment and demonstrates tangible benefits to consumers and stakeholders. • Attracts advocates – owners of electrified assets	• Possible it does not result in a just transition as it prioritises those that are able to afford latest technologies.	•

	(EVs, Heat Pumps, etc.).		
Types of customers	• Possible to target customers getting dwelling retrofits, including PV and heat pump installations. •	• Domestic customers already have half hourly automated meter readings.	Prepayment meters and fuel poor customers must be considered upfront, as opposed to the last phase as in RoI. This is important due to the high level of prepayment meters in Northern Ireland.
Meter types	• This provides a solution for those with tricky communications which need to be considered early on. • Does not require all meter types to be available at the same times.	• Practicalities and costs need to be considered in continuing legacy support. For instance, if prepay is 90% smart, there is a significant cost to support Prepay.	•
No prioritisation	• Simplifies the rollout process.	• May not fully optimise resource allocation or address critical needs in a timely manner.	•

8.5. Recommendations

Based on our analysis and consideration of the various options for the smart meter rollout strategy, we have several strategic recommendations, which are aimed to support the definition of the Northern Ireland rollout strategy. Each recommendation is supported by the detailed analysis completed as part of this project to ensure a successful and seamless transition to smart metering. Our recommendations include:

- We **suggest adopting an 'opt-out' and 'active' approach** based on identified learnings and the strong preference for this as identified in the workshops. This approach aims to streamline the process for consumers while still respecting consumer autonomy. However, further research, with a particular focus on capturing customer views, is necessary to confirm this rollout strategy is best placed for Northern Ireland.
- **Careful consideration should be made to how the rollout strategy is communicated.** Reference to a 'mandatory' rollout strategy should be avoided, and it would be prudent to use language that is more likely to instil confidence in consumers.
- It is crucial to outline the **proposed timeline for the rollout and list the main tasks** for the pre-rollout planning, installation phase, and post-installation monitoring. A comprehensive plan catering to different consumer segments with a strong consumer focus should be devised when designing the rollout strategy. Moreover, geographical aspects must be carefully considered to optimise the rollout process and prioritise areas for initial implementation.
- **Sufficient milestones should be clearly outlined** to enable effective progress tracking. Additionally, consumer feedback must be actively solicited and incorporated into the rollout strategy to ensure its responsiveness and adaptability. This dynamic strategy will enhance the rollout's success and address emerging challenges proactively.
- Further work needs to be undertaken to address **the issue of 100% coverage**. This should include a cost assessment and investigating the issues that might hold back a 100% coverage, such as geography, social, building type and disability.
- Further research, and in particular behavioural research, is vital to identify key customer segments that should be prioritised in the rollout strategy. Additional research on the geography is also required to maximise efficiency of resource deployment and smart meter uptake.
- The rollout strategy must strongly **consider the availability of consumer benefits**, including those from ToU tariffs, during the implementation of smart meters. Ensuring the availability of all benefits is crucial to fostering consumer uptake and trust in the new technology. However, careful consideration must be given to the potential "chicken & egg" situation arising from energy suppliers requiring consumption data generated by smart meters before being able to offer ToU tariffs. Balancing this dynamic is essential to effectively leveraging the benefits of ToU tariffs while addressing logistical challenges in their implementation.
- We recommend that **NIEN take the lead in both the rollout and roadmap development** for the rollout strategy. The roadmap should comprehensively address the needs of all stakeholders that have been identified as a priority, including system requirements stemming from grid constraints for example. The roadmap must ensure a fair and equitable transition, particularly for key groups in Northern Ireland (i.e., prepayment users).
- Additionally, **NIEN should establish a governance approach to effectively monitor the rollout process,** ensuring accountability and transparency throughout. This will also

allow the network to quickly react to challenges as and when they arise during the rollout of smart meters. However, literature reviews and stakeholder engagement identified the need to not over-govern the rollout.

- **KPIs for the rollout monitoring should include a diverse range of measures** beyond just installation quantities, as observed in the ROI rollout. By incorporating various measures, including functionality and usability assessments, the effectiveness and success of the rollout strategy can be more accurately evaluated. This approach is important to consider in the context of the GB rollout where there have been large quantities of non-functioning smart meters in GB post installation.

9. Summary of high level plan

We set out an indicative plan below, based on the recommendations described above. We have considered key components such as:

- Key gaps / questions which need to be addressed through further investigations
- Development of sub plans for key elements of the roll out
- Regulation that needs to be in place / updated
- The core activities themselves
- Governance and oversight activities, including stakeholder engagement

Note that the role(s) indicated as responsible for each activity are initial recommendations only based on lessons learnt from elsewhere during this piece of work and the final decisions are yet to be made after consultation.

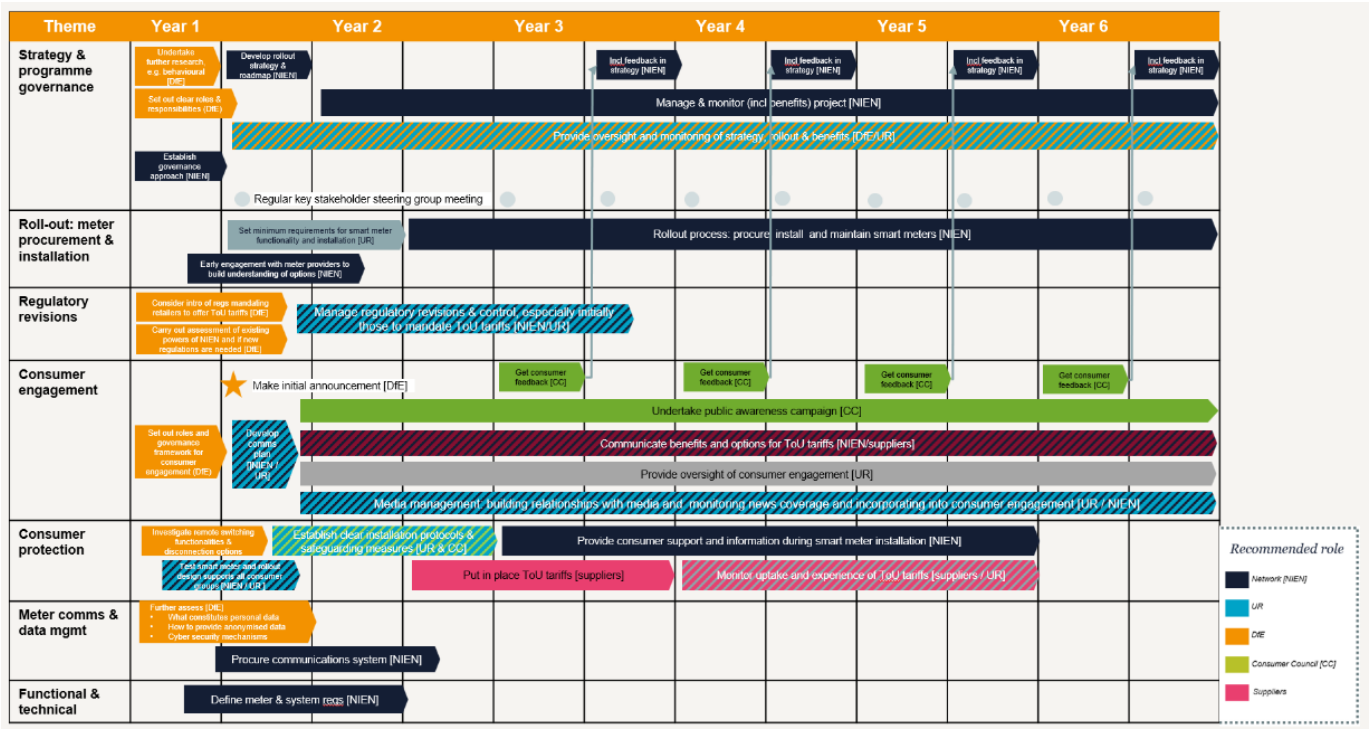

Figure 1: Northern Ireland smart metering design plan - all on one page

10. Risks and mitigations

The highlighted risks and mitigations captured in this section are taken from sections of the report above. For further explanation and context of the risks and mitigations, please refer to the main section of the report. (Risk- 1 = Low risk, 5= High risk).

Risk #	*Risk Type*	*Description*	*Risk*	*Mitigation*	*Risk after mitigation*
1	Meter communication risks	Managing associated risks from an 'open by default' approach	3	Establishing a steering board to oversee the development of protocols to ensure data is open	2
2	Consumer dissatisfaction and resistance	Delaying the implementation, increasing costs and reducing effectiveness of rollouts in communities	5	Ensure that the functionality of smart meters meets the needs of the prepayment market	2
3	Data management	A perceived loss of control over data privacy and pricing	5	A clear plan of control with responsible parties allocated	3
4	Data management	The risk of data breaches and cyber security threats, which can compromise consumer trust and delay implementation	5	Clear cyber security practices are practised throughout the smart meter rollout. The rollout would also comply with legal standards and safeguard consumer information	3
5	Data management	Unauthorized use of data by some stakeholders	4	Specific groups of stakeholders should have different access to data	2
6	Data management	Smart data identifying	4	Smart meter data stored on networks, would not be able to identify singular customer	2

Risk #	*Risk Type*	*Description*	*Risk*	*Mitigation*	*Risk after mitigation*
		customer behaviour		behaviour because of anonymisation and aggregation	
7	Data management	Energy system attack/blackouts	5	Cyber security practices are practised and prioritised through the smart meter roll-out	3
8	Vendor risk management	Cyber security threats through 3rd party vendors	3	Evaluate and manage the cybersecurity provided by vendor in the smart meter ecosystem.	1
9	Technical issues	Meeting the technical requirements of Smart Meters for a successful roll-out	3	Understanding and meeting the requirements to achieve reliable performance and user satisfaction. Tried and tested, off the shelf meters and systems should also be rolled-out.	2
10	Introducing suppliers/technology permutations	Increasing the combination of each will increase the complexity of the rollout and introduce additional expenses (as seen in GB)	4	As few suppliers / technology permutations should be introduced as possible to reduce the risk of faulty meters	2
11	Consumer buy-in	Consumer buy-in barriers could significantly delay the implementation of the roll-out	5	Understanding the barriers through stakeholder engagement and setting out plans to reduce consumer resistance in the early stages of the rollout	2

Appendix A – Acronyms

BCR – Benefit Cost Ratio

CBA – cost benefit analysis

CER – Commission for Energy Regulation

CRU – Commission for Regulation of Utilities

DCC – Data Communications Company

DESNZ – Department for Energy Security and Net Zero

DfE – Department for the Economy

DSO – Distribution System Operator

EV – Electric Vehicle

FTTP – Fibre To The Premises

GB – Great Britain

Gen1 – First generation smart meters

Gen2 – Second generation smart meters

HAN – Home Area Network

HoC – House of Commons

ICO - Information Commissioner's Office

IDS – Intrusion Detection Systems

IHD – In-home Display

KPI – Key Performance Indicator

LANs – Local Area Networks

NI – Northern Ireland

NIEN – Northern Ireland Electricity Networks

Ofgem – Office of Gas and Electricity Markets

PAYG – Pay As You Go

PDIS – Public Digital Identity System

PET – Privacy Enhancing Technologies

PLC – Power Line Communication

PMC – Project Management Consultancy

RF – Radio Frequency

RoI – Republic of Ireland

SME – Small and Medium-sized Enterprises

SST – Standard Smart Tariff

ToU – Time of Use

UR – Utility Regulator

WAN – Wide Area Network

Appendix B – Literature review

23_01123_NI Smart Meter_Lit review v2.p

Appendix C – Stakeholder engagement

As part of this study, LCP Delta carried out a stakeholder engagement exercise, including calls with key stakeholders and a series of workshops. This engagement included:

- Selected stakeholders from Northern Ireland, who are likely to be involved or affected (or represent those affected) by the rollout.
- Key stakeholders from the GB and ROI rollout to gather lessons learned and share best practice.

The outputs from the stakeholder engagement exercise have been woven throughout this report into the various 'Learnings from Stakeholder Engagement' sections.

We have provided an outline of the process for stakeholder engagement below:

Step	Summary
1. Stakeholder mapping	LCP Delta carried out a stakeholder mapping exercise to develop a long-list of stakeholders from GB, ROI and NI. A prioritisation exercise was then carried out to agree a shortlist for engagement. Stakeholder groups covered included: • Policy / regulation representatives • Technology and solutions providers • Consumer representatives and charities • Network companies • Energy suppliers • Consultancies • Flexibility providers and aggregators • Academics • Trade bodies
2. Early engagement	Through the stakeholder mapping exercise a small group of high priority stakeholders from GB and ROI was identified for early engagement. The early engagement provided the opportunity for input at the beginning of the project and feed into the design of the stakeholder engagement. The stakeholders were invited to a 30 minute virtual interview to discuss: • Key learnings from the smart meter rollout in the GB/ROI • Recommendations for the stakeholder engagement approach (stakeholder group and topics or questions to cover) • Key information sources to feed into the project

3.	**Workshops**	A series of workshops was held with the key stakeholders identified in the stakeholder mapping. Six workshops were held, grouped by theme. A summary of each workshop is provided below. Stakeholders were invited to the workshops most relevant to their organisation. Each workshop was attended by a range of stakeholders from NI, ROI and GB. The workshops were held virtually, using Microsoft Teams. An online whiteboard tool (Miro) was used to present questions and capture responses. This gave the ability to capture a breadth of ideas and views alongside more detailed discussion on key points. All attendees were provided with a summary of the discussion after the workshop.
4.	**Follow up calls and opportunity to input**	All stakeholders who attended the workshop were given a period after the workshops to follow up with any additional views or feedback. A small number of direct engagement was also carried out with stakeholders, either where they preferred not to input in a workshop format, were not able to attend or had additional input that was not sufficiently covered in the workshop.

10.1. Summary of workshops:

Workshop	Date	Summary of questions
Roles and responsibilities for industry, government and the utility regulator	8th May	• What are the key challenges around roles and responsibilities? • What are the different roles and responsibilities that need to be considered in the NI smart meter plan? • Who should be responsible for these roles and responsibilities? • What needs to happen allow these roles to be delivered? • Are there any other key stakeholders that have not been discussed?
Protecting consumers	2nd May	• What are the potential opportunities and benefits for consumers? • What are the risks to consumers associated with the smart meter rollout? • What do you think ‘consumer protection’ covers? • What features should smart meters have to support consumers? • Should we aim for a 100% rollout? If no, what approach should be taken and how do you support consumers that will not receive a smart meter? • Who incurs the cost of the smart meter roll-out?

		• How do you ensure all types of consumers can benefit from the roll-out? • Who should be responsible for supporting consumers, and how?
Smart meter data	9th May	• What data would stakeholders like to access? • What are the potential risks around smart meter data? • What are the lessons from other roll-outs (or other programmes e.g. water metering) regarding access to data? • How should customer data be stored and protected from unauthorised access in Northern Ireland? • Does the large proportion of pre-payment meters in Northern Ireland affect the management of data? If so, how? • Is there anything else we haven't covered relating to smart meter data?
Functional and technical requirements	7th May	• What are the options for smart meter functionality? (Must have, Should have, Could have, Won't have) • What features are necessary to gain consumer benefits and gain acceptance? • What can we learn from other roll-outs? How did the procurement process in GB / Ireland affect the choices around functionalities and timeframe? • What are the challenges regarding interoperability and compatibility with existing infrastructure and systems? • What features need to be included to ensure smart meters are at least as good as, or better than, existing pre-payment meters? • How can we ensure smart meters are, as far as reasonably possible, future-proofed?
Addressing barriers to customer buy-in	14th May	• What are the primary barriers preventing consumers (including small and medium businesses) fully embracing smart meter technology? • What does the ideal consumer experience look like? And, how do we achieve this? • What are the learnings from other rollouts or other relevant programmes / policies in achieving the ideal customer experience? • How do we get consumers in Northern Ireland on-board with the smart meter roll-out? • Who should be responsible for engagement with consumers? How, and when, should they deliver this engagement?

		• How do we ensure accessibility and inclusivity in the approach? • What feedback mechanisms can be established to continuously monitor customer satisfaction and address emerging concerns during the rollout and priority groups?
Rollout strategy	15th May	• Should the smart meter rollout be mandatory/voluntary and/or active/passive, and to what extent? • What are the pros and cons for mandatory/voluntary/active/passive rollouts? • Should there be a phased approach to installing smart meters? • What should the rollout strategy / phasing be and why? • How can risks such as cost overruns, inadequate installations and delays be prevented in a mass rollout? • What contingency plans should be deployed to address unforeseen challenges or disruptions during the rollout process? • What project management / governance approach should be taken? • Should targets be based on smart meters installed or fully operational as 'smart meters'? • What mechanisms should be in place for ongoing monitoring, evaluation and optimisation of the rollout strategy?

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