Energy Networks Innovation Process Project Closedown Report Document

Date of Submission: 25/07/2025

Project Closedown Report Document

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Project Title (*This cannot be changed once registered*)	Project Reference
ExtenDER	NIA_SSEN_0067
Funding Licensee(s)	**Project Start Date**
Southern Electric Power Distribution	August 2023
Project Duration	**Year**
1 year 2 months	2024-2025
Nominated Project Contact(s)	
Tim Sammon, Innovation Programme Delivery Manager at SSEN	

1. Scope

This project will focus on the Greater London Authority (GLA) area, where there are known constraints caused by Transmission related reinforcements. The project is focussed on market-based connections only and therefore will not consider DNO flexibility methods i.e. ANM or CMZ. However, it may suggest DNO flexibility methods where market-based connections are not suitable. This is a Phase 1 feasibility assessment of market-based connection tools, which may potentially lead to a much larger second Phase involving live trials of such a connection approach.

Pre-registration assessment estimates potential benefits of the ExtenDER approach could deliver up to £1.2bn of economic benefit to connecting parties over seven years, or £174m per year if its feasibility can be demonstrated. If feasibility is demonstrated, a refreshed estimation of potential benefits and the costs associated with accessing them will be reported.

2. Objective(s)

The project has the following objectives:

Phase 1

- Confirm the potential viability of a market for market-based connections. Report examples of capable sellers and buyers.
- Report the risks of market based connections to TOs, DNOs, buyers and sellers and discuss mitigation options.
- Propose a skeleton market-based connection agreement acceptable to TOs, DNOs, buyers, and sellers.

Phase 2 (Future Project)

- Understand the value of market-based connections to both buyers and sellers of energy capacity (i.e., is there enough support and buy-in for such a service).
- Compare value of market-based connections to costs of achieving the same connections using ANM and/or CMZ.
- Create a replicable market design.
- Create a market-based connection tool that can communicate with a Power Systems Analysis tool to automatically provide go/no-go decision on trades.
- Understand the interaction between existing connection agreements and the impact on other customers.
- Create a clear process from start to finish for market-based connections to operate.
- Understand what risk of market failure and its impact on the market-based element of the connection agreement is acceptable to users.
- Create a Framework for market-based connection operation including monitoring and legal implementation.

3. Success Criteria

The project will be deemed successful if:

Phase 1

- The solution is shown to have no detrimental impacts on the electrical network for which a mitigation has not been identified and tested, with sufficient confidence to proceed to a second trial Phase.

Phase 2

- Market Based Connections are considered as viable and useful for demand customers (i.e., the business proposition works)
- Market participation for those providing flexibility find the process accessible, and valuable.
- Market design produced is replicable.
- Market solution tool can communicate with Power Systems Analysis tool to automatically provide go/no-go decision on trades.
- The interaction between existing connection agreements and the impact on other customers is acceptable.
- A clear path for entry into and exit from a Market based connection is defined.
- The risk of market failure and its subsequent impact on the Market based element of the connection agreement is a risk that is acceptable to customers.

Framework created for Market Based Connection operation including monitoring and legal implementation alongside Access SCR.

4. Performance compared to the original project aims, objectives and success criteria

Details of how the Project is investigating/solving the issue described in the NIA Project Registration Pro-forma. Details of how the Project is performing/performed relative to its aims, objectives and success criteria.

Performance against the Phase 1 objectives are shown below.

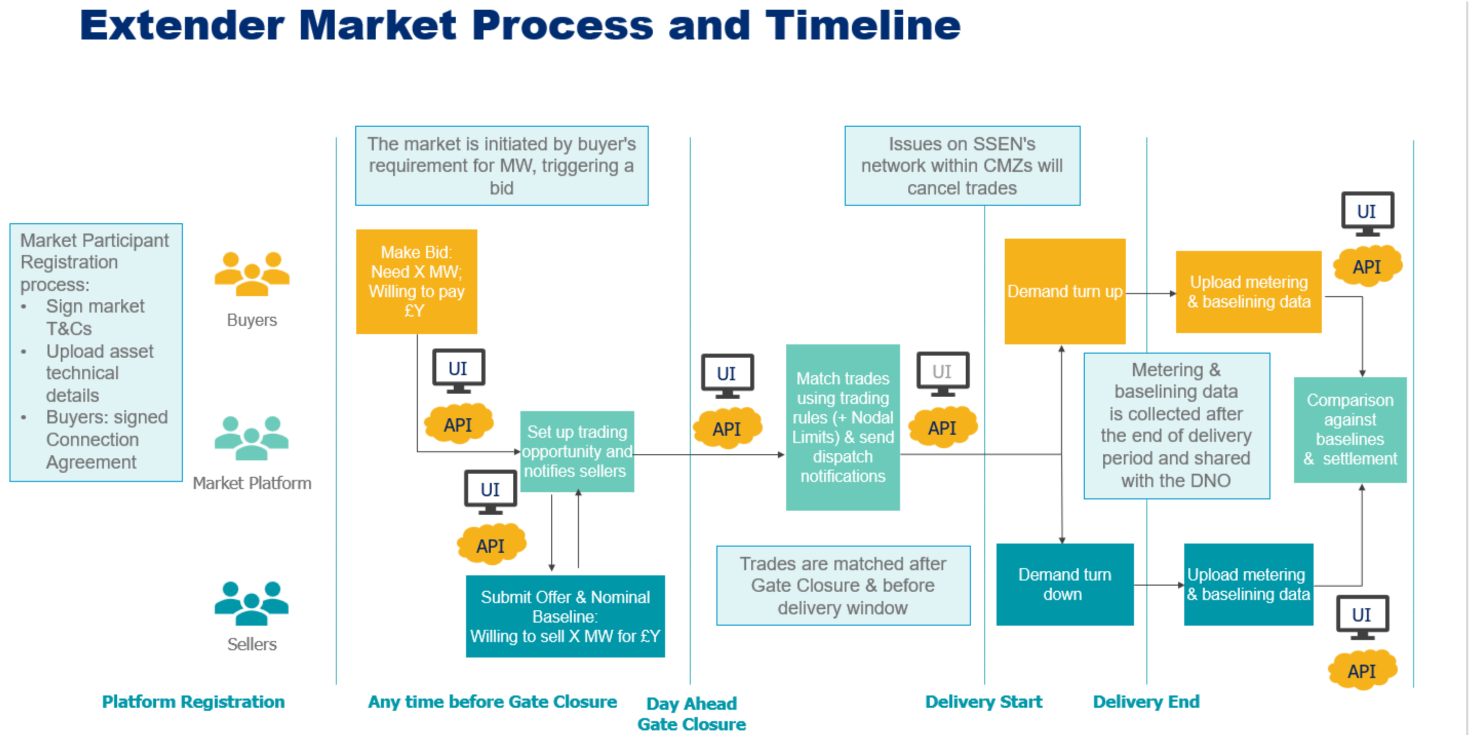
Phase 1

- Confirm the potential viability of a market for market-based connections. Report examples of capable sellers and buyers.
    - High level analysis was done by SSEN to get an indication of the number of customers that were waiting in the connections queue, which was broken down by size of connection and customer type (domestic, commercial, etc.). The numbers were high enough to confirm that a market-based connection approach might be suitable to connect some customers earlier than anticipated.
- Report the risks of market based connections to Transmission Network Operators TNOs, DNOs, buyers and sellers and discuss mitigation options.
    - Extensive stakeholder engagement took place to understand the risks of a market-based connection. A report can be supplied on these risks, but at high level they include:
        - Network Resilience – If market sellers don't turn down as promised, and the network is constrained, there is a chance of circuits tripping and customers losing supply.
        - Commercial Regulation – Distribution Use of System (DUoS) charging will be impacted as new market based connections do not fit in with the current processes and systems that DNOs use. This could result in high capacity charges or frequent fines for breaching capacity.
        - Market liquidity – Low market liquidity reduces the chance of successful peer to peer (P2P) trades occurring. This may reduce the likelihood of potential buyers engaging in this service due to unpredictable energy availability.
- Propose a skeleton market-based connection agreement acceptable to TOs, DNOs, buyers, and sellers.
    - The heads of terms have been agreed for testing, which are also available upon request.

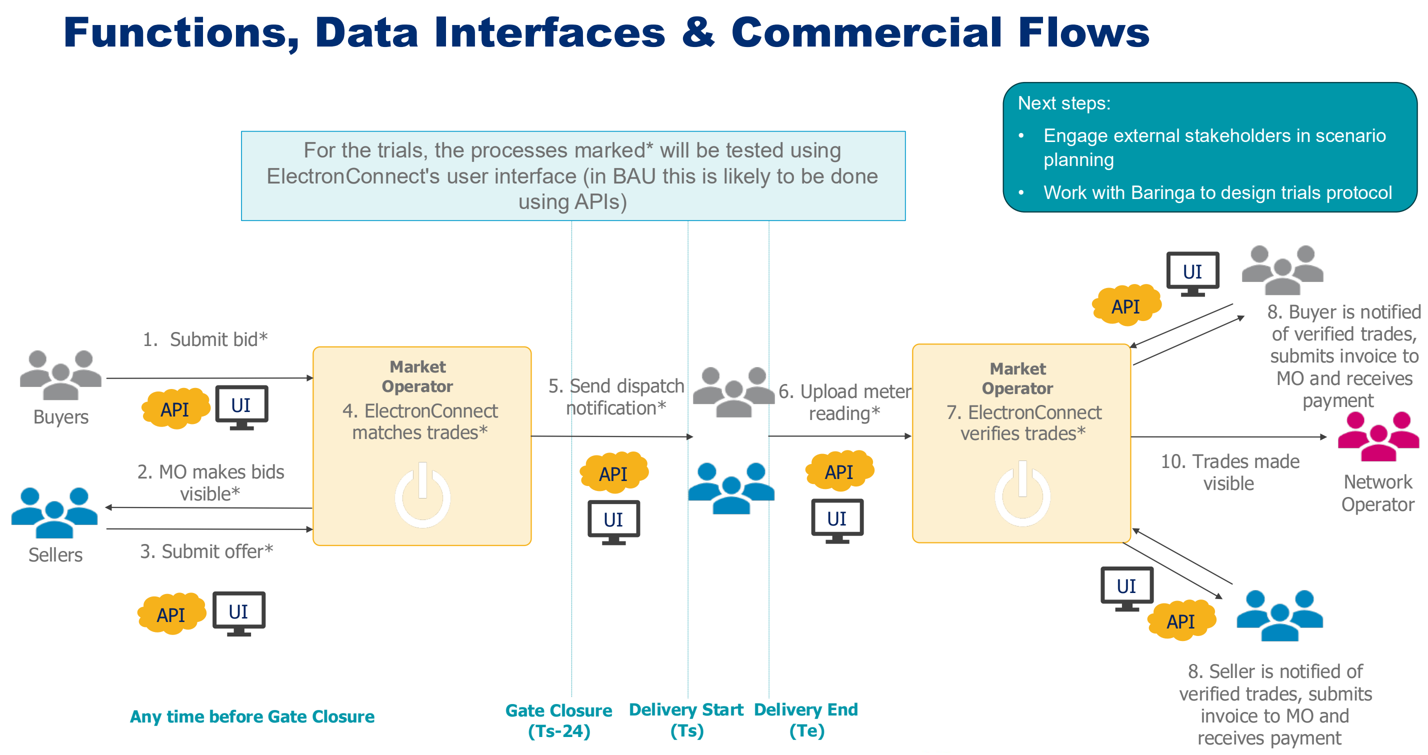
Phase 2

- Understand the value of market-based connections to both buyers and sellers of energy capacity (i.e., is there enough support and buy-in for such a service).
    - The main use case for market-based connections was to connect houses earlier. However, this was not feasible due to the risk that market based connection agreement obligations could not be transferred from property developers to domestic consumers. Stakeholder engagement did reveal that EV charging companies were interested in acting as both buyers and sellers. Aggregators and battery energy storage sites systems (BESS) were also interested in acting as buyers. Industrial and Commercial (I&C) companies were interested in selling. The pool of interested stakeholders expressing interest was fairly small and it was not clear if there were enough buyers and sellers co-located in similarly

  - constrained areas for an MBCA to work. However, it could have expanded over time, if more companies became interested.
- Compare value of market-based connections to costs of achieving the same connections using ANM and/or CMZ.
  - The project was closed early and so this activity did not take place.
- Create a replicable market design.
  - This was completed. The diagram below shows a high level overview of some of the thinking that took place. Additional supporting information can be provided upon request to help replicate what was done during ExtenDER.



- Create a market-based connection tool to automatically provide go/no-go decision on trades.
  - The project was closed early and so this activity did not take place.
- Understand the interaction between existing connection agreements and the impact on other customers.
  - There was little impact on existing connections agreements, as these had already been signed and agreed upon. The main point of conflict that was identified was around existing commercial processes that would have been impacted had an MBCA gone ahead. Commercial processes and IT systems would need to have been changed with sign off via the Energy Networks Association (ENA) by all DNOs. This would have required an additional project or ENA work package to have been completed post project. We did explore a temporary workaround for this issue, that would have involved the commercial team administrating MBCA trades. Due to the nature of MBCA trades causing breaches in allowed capacity, these would be flagged by the commercial system, which would then require additional administrative support to re-allocate charges and monitor trades to ensure they did not breach agreed trades. However, it became apparent that the commercial team did not have capacity to support this option and it was not a viable BaU option due to the amount of manual intervention effort required.
  - Our final decision to create a viable connection agreement required any new market participants, that desired to increase demand, to purchase a connection agreement for their total capacity, i.e. firm capacity plus MBCA capacity . This option also has risks as it means the existing overuse charging mechanism would be blind to MBCA capacity use without corresponding trades. It would also mean those parties wanting to engage in MBCA connections would have to pay higher connection fees, which is sub-optimal.
- Create a clear process from start to finish for market-based connections to operate.
  - This was complete as part of the market design work package. See diagram below for details. Additional supporting information can be provided upon request to help replicate what was done during ExtenDER.



- Understand what risk of market failure and its impact on the market-based element of the connection agreement is acceptable to users.
    - This was identified as part of the commercial design work package. See diagram below for details. Additional supporting information can be provided upon request to help replicate what was done during ExtenDER. Scoring was ranked 1 to 6, where 1 was lowest risk and 6 was highest. Every risk identified required a mitigation option to reduce or remove the risk occurring.

Managing product risks

The residual risks of the MBC product (not Gaming Risks) can largely be mitigated

Risk Category	Risk Description	Probability [1]	Severity [1]	Risk [2]	Mitigation
Market arbitrage	Ability to compete in other flexibility markets that are delivered at a higher voltage could drive up prices for MBC product offers.	2	2	4	Timing of different services reduces opportunity to arbitrage across different flexibility markets.
Trading capacity shortage	Buyers could trade for their entire MBC capacity to ensure they are not short at any time.	1	3	3	May not be an economically rational strategy on an individual trade or across trades and could prevent growth of the MBC product if it reduced ability of new market entrants to trade. Market allows LT trades but clears day ahead for all trades based on price.
Off market trading	After an initial trade on the market platform, buyers and sellers could approach one another directly and avoid trading in the market, reducing market liquidity.	2	3	6	Insist all trading occurs through the market platform for visibility and reporting purposes.
Bias to HV connected parties	Parties connected at lower voltages have fewer counterparties than those connected at higher voltages.	2	3	6	Normal market behaviour but could adjust algorithm to prioritise same voltage demand turn down first.

- Create a Framework for market-based connection operation including monitoring and legal implementation.
    - This was identified as part of the stakeholder engagement work package. See diagram below for details. Additional supporting information can be provided upon request to help replicate what was done during ExtenDER.

Secondary external stakeholders' workshops used to collect feedback on commercial & market design

Market Design Element	Market Design Element Decision	Stakeholder Feedback	Key Comments/Quotes
User Interface	UI for trials, APIs for BaU.	Happy with the use of UI for trials and APIs for BaU	'Need an API-based interface to which data can be sent for baselining'
Market Timing	Rolling gate closure	Gate closure needs to align with other ancillary service markets.	'Need to be able to arbitrage between this and flex market'
Market Timing	UI to be configured so that buyers can define delivery windows	Buyers should be able to set delivery windows: weeks, days, EFA blocks or specific half hours. Buyers want easy way to setup recurring events too.	'Day ahead works well, e.g. battery operators can make a decision on how much they'd be willing to pay to participate in frequency control and/or other ancillary service markets.' 'C&I customers can interrupt processes at latest day before'
Market Timing	UI to be configured so that buyers can initiate markets in advance.	Buyers wanted the ability to initiate markets far in advance of needing the capacity to gauge initial interest.	'Turn-down could be required ahead of time so that the buyer has delivery/trade certainty.'
Baselining	Nominated baseline to establish objections process with market operator for outlier event e.g. batteries providing other services.	Baselining should be kept simple	'Need a baselining methodology that will apply to different types of assets'
Market Operator Role	The System Operator does not have any responsibilities for this market (traded product) other than defining geographical trading boundaries where trades are permitted.	Market operator should be independent of DNO, and will require further discussions	'I don't think it is a good idea for the market operator to be the DNO'
Liabilities	No non-delivery liabilities on sellers.	Market needs to be designed to ensure potential liabilities do not prevent market participation.	'liability should be in the contractual arrangement (after the event) and wouldn't be any different to any other BaU event'
Control	Trading will cease during unexpected outages. If a seller did not deliver required turn-down 3 times, they would be banned from entering this market in future	Cease trading notifications should be managed in a similar way to today and match risk levels accepted by assets in existing markets today.	'If there is a lot of trades ceasing then it would be an unattractive control'

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Baringa Confidential

Performance against the success criteria is shown below:

Phase 1

- The solution is shown to have no detrimental impacts on the electrical network for which a mitigation has not been identified and tested, with sufficient confidence to proceed to a second trial Phase.
    - We conducted extensive stakeholder engagement at this point, which helped identify risks and mitigations as part of the project plan. Overall, key stakeholders approved the move forward to live trials.

Phase 2

- Market Based Connections are considered as viable and useful for demand customers (i.e., the business proposition works)
    - The project was closed early as we could not determine that this was viable for the core customer group we were looking to impact i.e. Housing developers. This was because market based connection agreement obligations could not be transferred from property developers to domestic consumers. However, we did identify some stakeholders that were willing to participate e.g. aggregators and EV charging companies. It is possible that a new project is carried out using these customers instead.
- Market participation for those providing flexibility find the process accessible and valuable.

  - N/A This process did not take place as we did not conduct live trials.
- Market design produced is replicable.
  - This was achieved as detailed in the performance against objectives section above and findings can be made available upon request.
- Market solution tool can communicate with Power Systems Analysis tool to automatically provide go/no-go decision on trades.
  - This was not achieved as the project was closed early and live trials did not go ahead. It was decided that power flow analysis on a per trade basis was impractical and unnecessary as simple arithmetic to balance MCBA power flow with a reciprocating peer to peer flexibility purchase would suffice.
- The interaction between existing connection agreements and the impact on other customers is acceptable.
  - This was deemed to be acceptable. We did not discover any interaction or impact of an MBCA impacting an existing connection agreement.
- A clear path for entry into and exit from a Market based connection is defined.
  - This was defined as part of the market design phase of the project as detailed in the performance against objectives section above. More information can be shared upon request.
- The risk of market failure and its subsequent impact on the Market based element of the connection agreement is a risk that is acceptable to customers.
  - The risks were made clear to market participants during stakeholder workshops to gather interest in live trials. We proposed a few ideas, such as fines, but this did not sit well with participants. As a result we decided upon exclusion from the MBCA after a three strikes rules e.g. failure to turn-down by the amount claimed three times for sellers. Buyers would have their connection agreement revoked and would have been disconnected if they turned up without agreement being reached for one or more parties to turn down by the required amount.

5. Required modifications to the planned approach during the course of the project

The Network Licensee should state any changes to its planned methodology and describe why the planned approach proved to be inappropriate. Please confirm if no changes were required

As Phase 1 had successfully demonstrated that the project would have no detrimental impact on the electrical network, the project moved to Phase 2 as detailed in the PEA, which meant more time and cost to achieve the Phase 2 objectives.
Initially, 4 months was planned for Phase 1. With Phase 2 proceeding, the new total time scale was estimated to be 2 years and 5 months. Phase 1 costs were £185,884. Updated total costs to include Phase 2 are estimated to be £1.59m.
However, the project was closed early due to an inability to realise the benefits initially estimated in the PEA Forecast for housing developers to connect early in constrained areas. Final costs incurred were £635.8k and the project ended after 1 year and 2 months.

6. Lessons learnt for future projects

Describe how the project (methodology, stakeholder engagement etc.) changed, or provided opportunities, from your expectation at the start of the project and therefore could be useful for a future project. In addition, please discuss the effectiveness of the research development or demonstration undertaken.

With the benefit of hindsight, we could have closed the project after phase 1. There were many project risks, so we could have spent less focus determining if they could be overcome and focussed more on whether the project could have achieved the benefits by enabling the connection of new housing development at this stage prior to continuing. Another key learning is whether there is a clear route to Business as Usual (BaU). As the project progressed it became evident that the route to BaU posed significant challenges as more problems surfaced through stakeholder engagement activities. More upfront stakeholder engagement to ensure a viable route to BaU existed could have been carried out by the DNO prior to starting the project to ensure internal stakeholders supported the concept with a clear route to business adoption.

7. Data Access & Quality Details

A description of how any network or consumption data (anonymised where necessary) gathered in the course of the Project can be requested by interested parties. Please include a link to the publicly available data policy.

For information how to request data gathered in the course of this project, see Network Innovation Competition (NIC) and Network Innovation Allowance (NIA) Data Sharing Procedure at https://ssen-innovation.co.uk/innovation-strategy/.

8. Foreground IPR

A description of any foreground IPR that have been developed by the project and how this will be owned.

All foreground IPR can be made available upon request, which details market and commercial design as well as other supporting information on how a Market Based Connection Agreement would operate.

9. The outcomes of the project

When available, comprehensive details of the Project's outcomes are to be reported. Where quantitative data is available to describe these outcomes it should be included in the report. Wherever possible, the performance improvement attributable to the Project should be described. If the TRL of the Method has changed as a result of the Project this should be reported. The Network Licensee should highlight any opportunities for future Projects to develop learning further.

1. **Market-Based Connections Product Overview**: An overview of the Market-Based Connection Product and how it compares to other connections products and provides a process and roadmap to apply for Market-Based Connection capacity.

Key features of the MBC product

- A Market-Based Connection (MBC) product should enable an earlier connection that preserves the queue position for transfer to a Standard Connection once the infrastructure upgrade is complete.
- The MBC product is additive to the existing suite of connection products provided by SSEN and is suitable for sites that:
  - require a higher Maximum Import Capacity (MIC) and guaranteed increases that are not provided by a Standard Connection.
  - require a higher level of MIC sooner than can be provided by a Ramped Connection.
  - cannot accommodate the immediate reduction of demand required by a Flexible Connection.
- The MBC product allows a new site to connect with a level of firm capacity and the ability to increase its electricity demand above this level, provided it has a bilateral trade with an existing demand site that will reduce its baselined electricity demand (kW) between agreed times.

The MBC product provides a site with:

a) Firm capacity: this enables normal site operation for most of the year but cannot meet the additional operational capacity needs during network peak times.

b) MBC capacity: This can meet the additional operational capacity needs during network peak times. It can only be used if there is an existing bilateral trade with another demand site in the same network area that reduces its demand by the same amount and at the same time. A site may be required to trade for MBC capacity outside of network peak times if there is a high level of network congestion.

How the MBC works

The MBC product allows "buyers" to buy turn-down from "sellers" to enable use of their MIC. The approach is designed to align with SSEN's BaU operations.

Summary of key product design elements			
Utilisation of MIC	**Verification of MIC Utilisation**	**Payment for connection charges**	**Payment of DUoS charges**
Buyer • The Buyer can use Firm capacity at any time. • The Buyer can only use MBC capacity if there is already a matching trade for the energy usage between the start and end times for the use of MBC capacity.	**Buyer** • Provides forecast of utilisation of MBC capacity at day ahead stage to reflect any trades. • Market Operator uses HH data post-event to verify utilisation against forecast.	**Buyer** • All connection charges are payable when first connected as the full capacity (Firm capacity and MBC capacity) can be used at any time from first connection.	**Buyer** • The Buyer pays DUoS charges on all contracted MIC (Firm capacity and MBC capacity) and imported energy. • The DUoS charges will not be reduced if the contracted MIC is not used. • Any change to this position will require industry / system changes.
Seller • The Seller can use their Firm capacity at any time there is not a trade. • During trade periods, the Seller should reduce their energy usage between the start and end times of the trade.	**Seller** • Provides forecast of utilisation of Firm capacity at day ahead stage to reflect any trades. • Market Operator uses HH data post-event to verify utilisation against forecast.	**Seller** • No charge as site already connected.	**Seller** • The Seller pays DUoS charges on all contracted MIC and imported energy. • The DUoS charges will not be reduced if the contracted MIC is not used or during a trade when the energy usage is reduced for the duration of the trade.

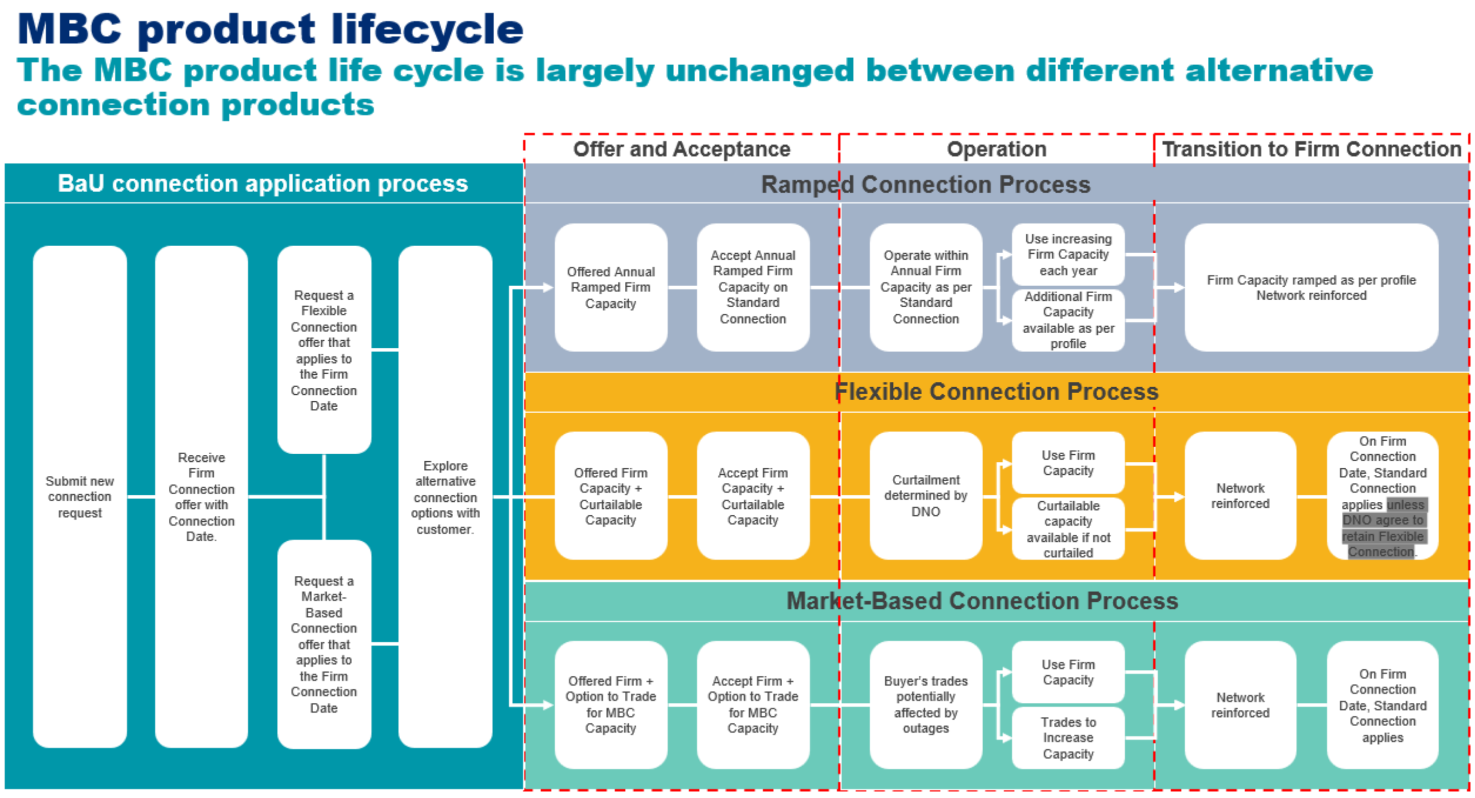
2. **Commercial Design, Market Design and Gaming Risks**: Market and trial design elements for the traded product guided by past projects and internal stakeholder feedback. Key proposed product potential impacts and mitigation measures.

Purpose of the Commercial Design
The commercial design section outlines how the MBC product is structured to be financially viable and attractive for demand customers while ensuring network stability. The design was developed to test feasibility, clarify customer needs, and establish a foundation for integrating the MBC into SSEN's business-as-usual (BaU) operations if the trial succeeds.

Key Elements of the Commercial Design

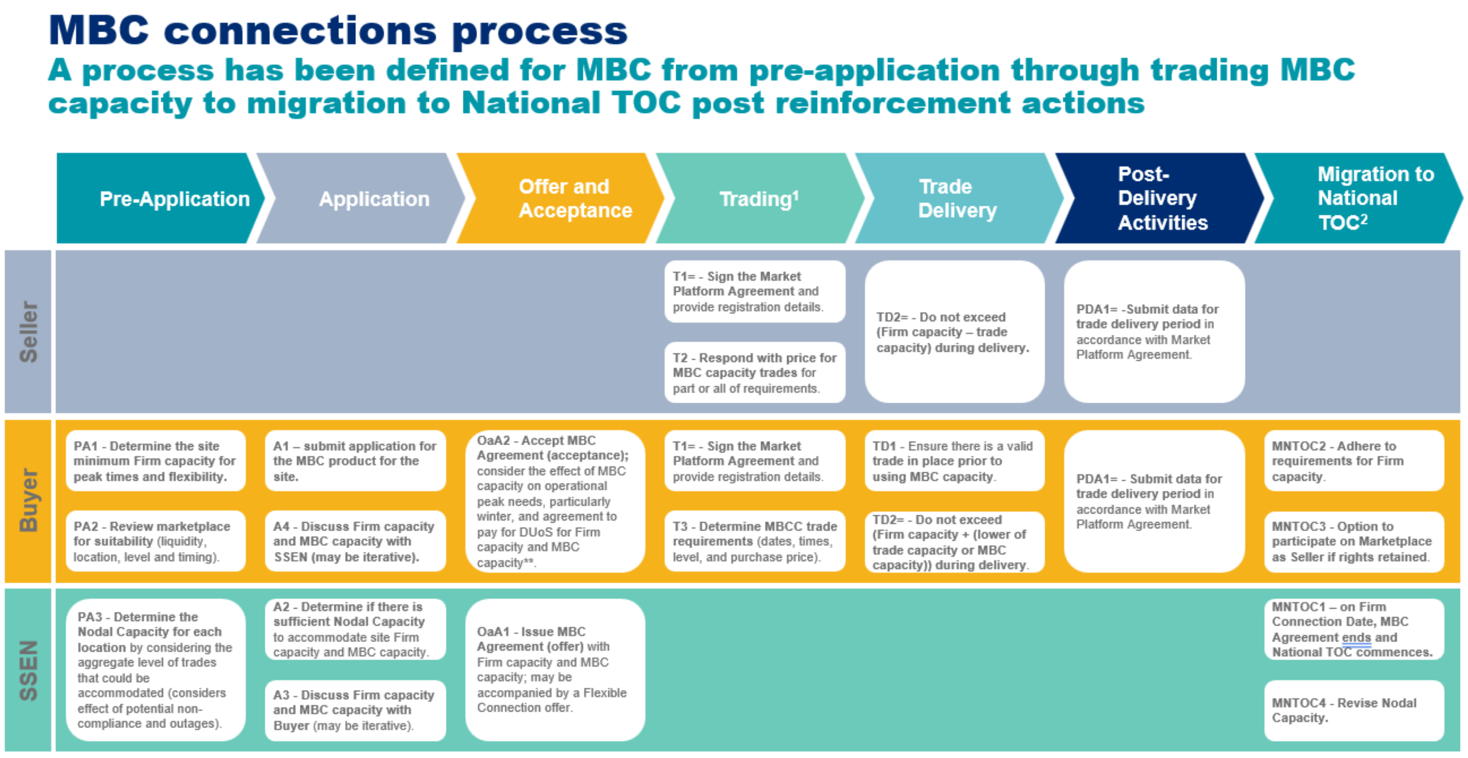
1. Addressing Connection Constraints
    - MBC is an "additive" product, meaning it does not replace existing connection products but offers an alternative for demand sites awaiting infrastructure upgrades.
    - Focuses on new demand sites that need higher MIC or faster access to capacity than traditional connections allow.
    - Preserves queue position for a firm connection once upgrades are complete.

2. MBC Product Lifecycle
    - Pre-application: Sites express interest and assess suitability.
    - Trading MBC capacity: Sites participate in bilateral trades to secure additional capacity.
    - Migration to a standard firm connection: Once infrastructure upgrades are completed, sites transition to a permanent connection.



3. Nodal Capacity & Risk Management
    - SSEN sets a Nodal Capacity Limit to ensure safe operation and prevent overloading.
    - Factors considered when setting limits:
        - Existing network headroom.
        - Outage impacts.
        - Network congestion risks.
    - Applications for MBC are ranked based on:
        - Queue position.
        - Readiness to connect.
        - Level of MBC capacity requested vs. total capacity available.
    - Sites with the best ranking receive MBC agreements first.

4. Trading and Market Design
    - Sites must trade capacity to access MBC (i.e., they must buy reductions in demand from existing sites).
    - Trading rules:
        - Buyers and sellers agree on turn-down periods.
        - Pre-agreed network limits apply.
        - Trading must happen in advance to ensure stability.



5. Cost Structure & Customer Charges
- DUoS (Distribution Use of System) Charges:
  - Customers must pay standard DUoS charges on their total MIC, even if they trade MBC capacity.
  - This could make the product less attractive if market liquidity is low (i.e., if finding a trade partner is difficult).
  - Potential risk: DUoS charges could impact profitability for buyers relying on MBC trades.
- Cost Recovery Model for Market Operator:
  - Several pricing models were considered, with a fixed fee per trade being the preferred option to minimize barriers to entry.

6. Potential Risks & Mitigations
- Market Liquidity Risk: If too few buyers or sellers participate, trading may not be viable.
  - Mitigation: Stakeholder engagement to ensure interest and participation.
- Gaming Risks: Potential for price manipulation or artificial constraints.
  - Mitigation: Transparent market rules and baseline monitoring.

The commercial design ensures the MBC product is financially viable, aligns with SSEN's operations, and provides a fair and structured way for demand sites to connect earlier. However, customer costs, market liquidity, and regulatory considerations remain key challenges for the product's success.

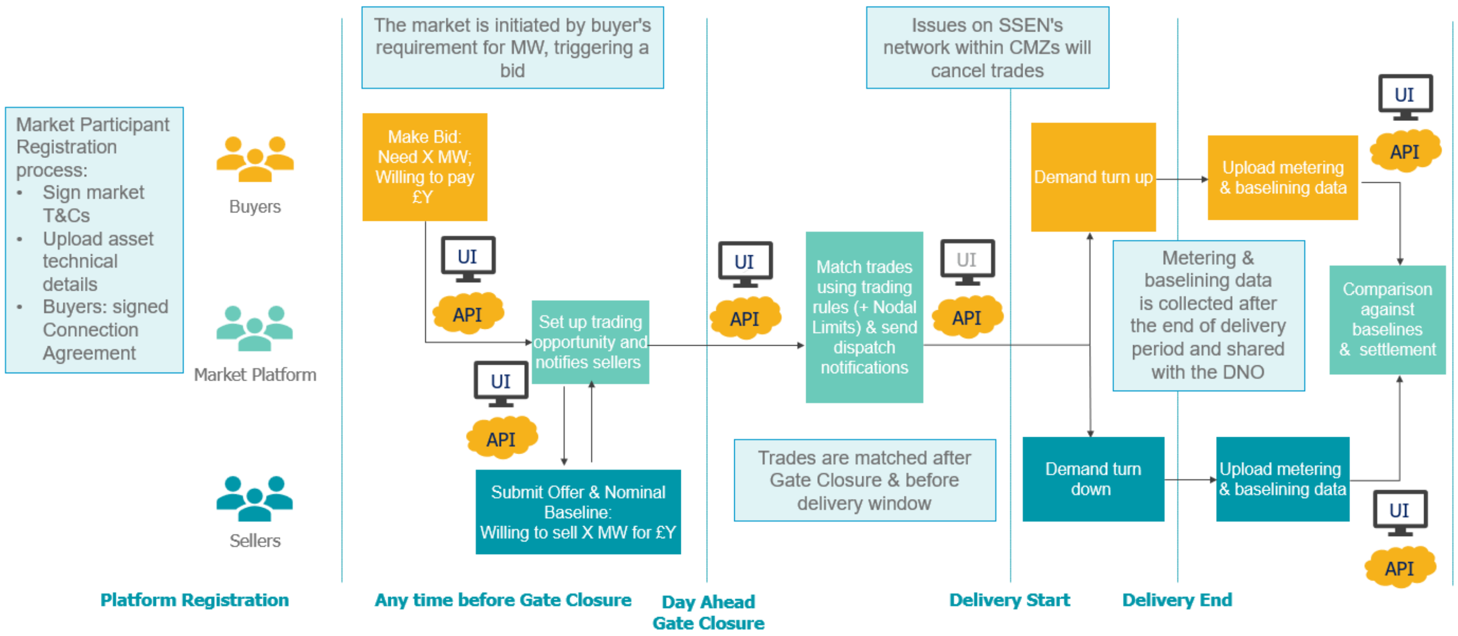
Purpose of Market Design
The market design defines how the MBC product operates, including trading mechanisms, participant rules, and trial structure. It ensures that buyers and sellers can trade demand turn-down effectively, allowing new sites to access capacity while maintaining network stability.

Key Elements of the Market Design

1. Market Objectives
- Primary Goal: Enable cost-effective, peer to peer trading of electricity capacity.
- Secondary Goals:
  - Ease of operation – Simple processes for buyers and sellers.
  - Transparency – Visibility of trades and outcomes.
  - Fairness & neutrality – No discrimination in market access.
  - Investment potential – Encourages long-term participation.

2. Trading Mechanism
- Buyers (new demand sites) need additional import capacity.
- Sellers (existing demand customers) offer to reduce their demand in exchange for payments.
- Trade Matching:
  - Day-ahead gate closure: Buyers submit bids, sellers submit offers.
  - Batch auction clearing: Trades are matched based on price priority (cheapest offers are matched first).
  - Nodal capacity limits set by SSEN determine how much capacity can be traded in each area.

Extender Market Process and Timeline

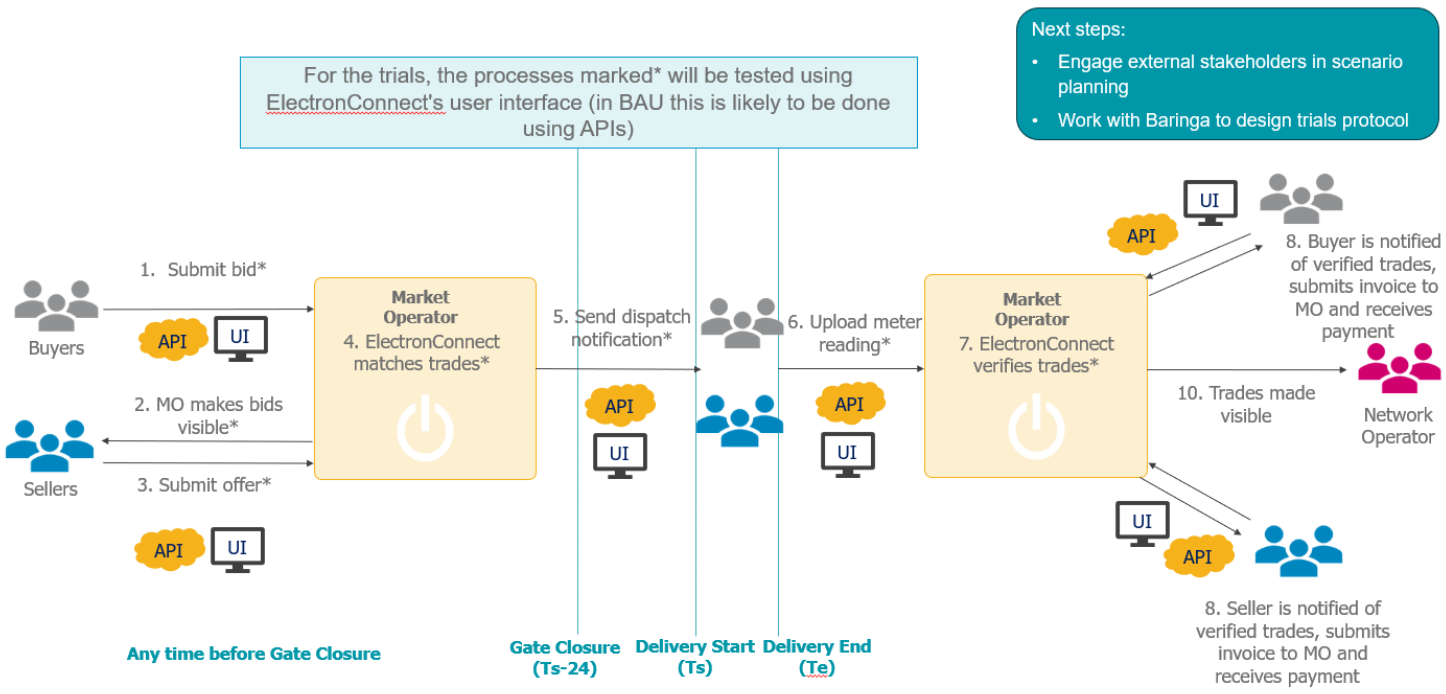


3. Market Participation & Rules
    - Who can participate?
        - Buyers: Existing/new network customers who need more capacity.
        - Sellers: Existing customers who can turn down demand on short notice.
    - Eligibility Criteria:
        - Must be in SSEN-defined geospatial areas.
        - Must have half-hourly metering and meet technical standards.
        - Buyers must sign an MBC agreement.

4. Pricing & Trade Execution
    - Two-Sided Pricing Model:
        - Buyers bid a maximum price they are willing to pay.
        - Sellers offer a minimum price they are willing to accept.
        - Pay-as-clear batch auctions set final trade prices.

5. Market Operation & Settlement
    - Market Operator (MO) manages trading, verification, and settlement.
    - Dispatch & Delivery Process:
        - Buyers and sellers receive dispatch notifications.
        - Metering data is verified post-delivery to confirm compliance.
    - Settlement:
        - Payments are processed based on successful trades.
        - Baseline monitoring ensures sellers reduce demand as agreed.

Functions, Data Interfaces & Commercial Flows



6. Risk Management & Stakeholder Feedback
    - Key Risks & Mitigations:
        - Liquidity risk: Insufficient buyers/sellers may impact market function.
            - Solution: Engage more participants and simplify entry requirements.
        - Gaming risks: Sellers withholding capacity or manipulating demand.
            - Solution: Baseline verification and penalty structures.
    - Stakeholder Feedback:
        - Participants support the concept, but liquidity concerns remain.
        - API-based integration requested for automated trading.

The MBC market is designed to facilitate peer to peer capacity trading, helping sites connect sooner.

What is Gaming?
Gaming occurs when participants exploit weaknesses in market design or rules to gain an unfair advantage, potentially harming other market users and disrupting fair trading.

Identified Gaming Risks (Ranked by Severity & Likelihood)

1. Monopoly Pricing (Highest risk)
    - Risk: In areas with few sellers, one entity could inflate prices for demand turn-down capacity.
    - Impact: Buyers may struggle to secure affordable capacity, undermining the MBC market.
    - Mitigation: Encouraging more participants, setting price caps, and monitoring trade patterns.

2. Tacit Collusion
    - Risk: Multiple sellers could coordinate (without direct communication) to keep prices high.
    - Impact: Artificially high prices reduce market efficiency.
    - Mitigation: Transparency measures and automated monitoring of trade behaviours.

3. Withholding Capacity
    - Risk: A seller may refuse to offer demand turn-down, creating artificial scarcity to drive up prices.
    - Impact: Fewer trades, higher costs, and reduced network flexibility.
    - Mitigation: Minimum participation requirements and seller performance tracking.

4. Baseline Manipulation
    - Risk: Sellers could artificially inflate their baseline demand before trading, making it appear that they are offering larger reductions than they actually are.
    - Impact: False savings, inefficient trading, and higher costs for buyers.
    - Mitigation: Strict metering & verification, real-time monitoring, and penalties for discrepancies.

5. Regulatory Arbitrage
    - Risk: Participants might exploit differences in regulations across zones to gain an unfair advantage.
    - Impact: Unintended market distortions and regulatory loopholes.
    - Mitigation: Standardized rules across regions and periodic rule reviews.

6. Information Asymmetry
    - Risk: Some participants may have access to insider information, giving them an unfair advantage in pricing or trade timing.
    - Impact: Unfair competition and reduced trust in the market.
    - Mitigation: Ensuring equal access to market data and transparent trade reporting.

7. Explicit Collusion (Lowest risk)
    - Risk: Buyers and sellers secretly coordinate to manipulate prices or trade outcomes.
    - Impact: Severe distortion of market fairness.
    - Mitigation: Strict penalties, monitoring, and market oversight.

Key Takeaways

- Monopoly pricing and withholding capacity are the biggest threats.
- Market monitoring, transparency, and participation rules can mitigate risks.

3. **Stakeholder Engagement**: Stakeholders involved in the project included buyers & sellers' (external participants) as well as SSEN internal stakeholders. Feedback used to guide the MBC and the traded product design.

Purpose of Stakeholder Engagement
This section details how SSEN engaged with stakeholders (buyers, sellers, and industry participants) to gather feedback on the MBC product, market design, and trial structure. It highlights key insights, concerns, and the development of Heads of Terms (HoTs) for participation.

Key Stakeholder Engagement Activities

1. External Stakeholder Workshops
    - Two initial workshops:
        - Identified seven potential trial participants and two observers.
        - Confirmed high industry interest in the MBC product.
        - Participants agreed the market would help them connect faster.
        - Key concern: Market liquidity (enough buyers & sellers to make trades viable).
    - Follow-up workshop:
        - Gathered feedback on commercial, market, and trial design.
        - Explored ways to simplify contracts to increase seller participation.
        - Some interested parties lacked assets in the constraint area, limiting trial participation.
    - Final workshop:
        - Presented refinements to the MBC product.
        - Discussed long-term business-as-usual (BaU) implementation.

2. Internal Stakeholder Engagement (SSEN Teams)
    - Four internal workshops with SSEN personnel.
    - Topics covered:
        - Commercial design refinements.
        - Market and trial design feedback.
        - Regulatory and operational considerations.
    - Two Steering Committee meetings:
        - Provided final approvals for market & trial approach.
        - Ensured alignment with SSEN's long-term strategy.

Key Stakeholder Insights

- Market Demand: Broad agreement that faster connections are needed.
- Liquidity Concerns: Buyers worried about finding enough sellers to trade with.
- Contractual Complexity: Sellers wanted simplified participation terms.
- Revenue Potential: Some participants needed clearer financial benefits before committing.

4. **Cost Benefit Analysis**: Estimate benefits for Buyers and Sellers with illustration to help understand how to price.

Purpose of the CBA
The Cost-Benefit Analysis (CBA) assesses whether the Market-Based Connection (MBC) product provides a net benefit by comparing its economic advantages (earlier connections, cost savings, carbon reduction) to its implementation costs.

Key Benefits of the MBC Product

1. Faster Connections for Demand Customers
    - Reduces waiting time for new sites from 5+ years to months/years.
    - Helps businesses start operations earlier, leading to higher economic productivity.
2. Financial Benefits
    - Producers (businesses waiting for connections) can start earning revenue sooner.
    - Consumers gain earlier access to products/services that require electricity.
3. Carbon Saving Benefits
    - Earlier integration of low-carbon technologies (e.g., EV charging stations, battery storage) can promote additional use of renewable generation when used during off-peak hours or during periods of excess renewable generation.

Key Costs of the MBC Product

1. Market & Platform Operation Costs
    - Setting up and maintaining the trading platform.
    - Admin costs for managing market transactions & settlement.
2. Implementation & Administration Costs
    - Developing MBC agreements and ensuring network compliance.
    - Regulatory approvals and ongoing market monitoring.
3. Potential Risks Affecting Costs
    - DUoS Charges: Sites must pay full Distribution Use of System (DUoS) charges even when using MBC, impacting financial feasibility.
    - Liquidity Risk: If there aren't enough buyers and sellers, the market might not function efficiently, reducing its value.

Producer Benefits & Financial Impact
The CBA analysed three types of customers:

1. Generic Industrial & Commercial (I&C) Businesses
    - Would pay more for early connection since electricity is a small part of their costs.
    - Benefit: £130 - £1,500 per MW per settlement period (SP) when trading in all SPs.
    - Much higher benefit (£4,000 - £59,000 per MW/SP) if trading only during winter peaks.
2. EV Charging Operators
    - Less financially attractive if required to trade in all SPs.
    - More beneficial when trading only in winter peaks due to high daytime demand.

3. Non-Profit Institutions (Education, Government, Healthcare, etc.)
    - Compared MBC cost vs. battery storage alternative.
    - High benefit in winter peak trading scenarios.

Accelerating Connection Timelines

- SEPD (Southern Electric Power Distribution) would benefit more than SHEPD (Scottish Hydro Electric Power Distribution) due to greater demand network constraints.
- The MBC product could bring forward connections by months or even years, depending on:
    - How many customers accept MBC.
    - What percentage of the existing connection queue is "genuine" (not speculative or abandoned projects).

Key insights

- The MBC product delivers significant benefits, especially when trading is only required in peak periods.
- Industrial & commercial customers benefit the most, while EV chargers and non-profits see advantages in specific cases.

Early Closedown
The project was closed early and did not go through the live trial period as initially planned. Various obstacles existed such as Low TRL, no business appetite for the tool, high risk of allowing the market to facilitate connections in constrained locations, and crucially, the use case for connecting houses was not feasible as market based connection agreement obligations could not be transferred from property developers to domestic consumers, which meant the anticipated benefits described in the Project Eligibility Assessment (PEA) document could not materialise.

10. Planned implementation, recommendations or next steps

Please describe the next steps to implement this innovation project. What policies and standards need to be updated or created as part of this implementation.

There are no plans to implement the Extender Project into BaU and we have closed the project down early. It is possible that the learnings derived from Extender can be used for other projects with different use cases that require peer to peer trading.

11. Net Benefit Statement

A qualitative and quantitative statement of whether the Project has delivered and is expected to deliver any net benefits. This will provide an update to the statement of projected net benefits required at project registration (as set out in table 3.1). Where a completed Project is expected to deliver benefits, the statement should detail:
a) the net benefits the Project delivered so far up to the point of issuing the net benefit statement, and
b) the net benefits the Project is forecast to deliver, should the innovative solution be implemented more widely.

N/A – The project was closed early with no intention to implement into BaU.

12. Other comments

N/A