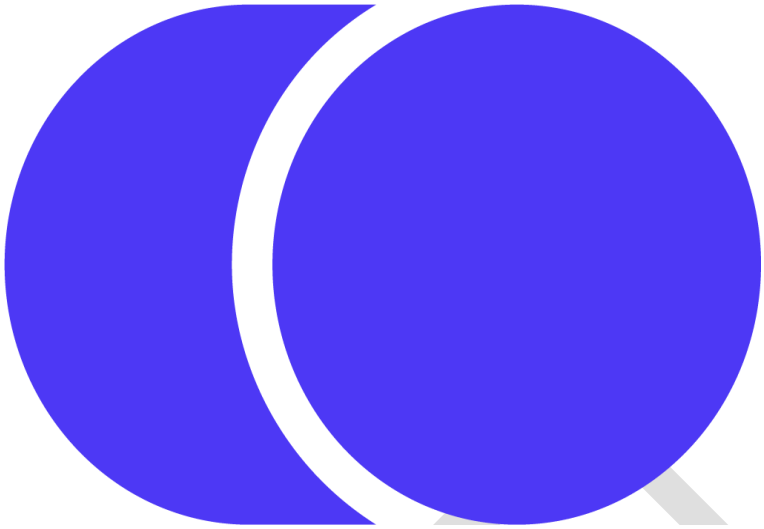


White Paper: *Energy Theft Reduction*

Draft for TIG consultation

Document Control

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Introduction

The Retail Energy Code (REC) requires RECCo to maintain and regularly review a **Theft Reduction Strategy** to support Energy Suppliers in minimising energy theft, in line with the objective set out in Condition 12A of the Supply Licence. This obligation requires suppliers—individually or in collaboration—to detect, investigate, prevent, and deter theft. Similar duties also apply to Gas Transporters and Electricity Distribution Network Operators under their respective licences.

One of the first deliverables under the strategy was to produce a robust estimate of the scale of the problem. The **Theft Estimation Methodology (TEM)** was the first attempt in over a decade to quantify energy theft across Great Britain. Published during a period of high post-COVID energy demand and global market disruption, the TEM estimated annual theft at **636–1,059 GWh of gas and 1,703–2,837 GWh of electricity**, with a combined cost of **£0.9–£1.4 billion**, equivalent to around **£50 per bill-paying consumer** (at December 2022 prices).

Since then, wholesale energy prices have fallen, and Ofgem's default tariff cap has adjusted accordingly. However, as price-based valuations can fluctuate significantly each quarter, RECCo will continue to use the original TEM estimate as a consistent reference point—until the methodology is updated—so that any future changes reflect **actual shifts in theft volumes**, not just market pricing.

Theft Reduction Strategy

RECCo employs an Energy Theft Reduction Strategy which aims to empower REC Parties to prevent, detect and respond effectively to energy theft.



- **Prevent** — Activities to deter theft, through raising awareness of the risk of organised fraud, including scam services to avoid energy bills
- **Respond** — Enhancing the ability of industry parties to deal with individual cases of theft once detected and to gain insights for better prevention and detection
- **Detect** — Better use of data and analytics will enable us to assess the scale of theft and other sources of soluble non-technical losses of energy to the system, as well as providing insights on where those losses are occurring and the effectiveness of mitigating measures

This white paper is intended as an **informal consultation document** to gather early stakeholder views on a set of potential enhancements to the energy theft reduction framework under the Retail Energy Code (REC). The proposals outlined herein span a range of conceptual maturity—from extensions to existing tools and services, to entirely new initiatives—and build on previous work undertaken by RECCo and wider industry partners.

We are committed to maintaining momentum on this important issue, but we also recognise the importance of balancing ambition with practicality. Many of the proposals in this paper—such as improved data sharing, new performance assurance metrics, or trialling physical deterrents—could carry material costs or require complex coordination. It is therefore essential that we secure early and informed feedback before committing significant resources or initiating formal REC change processes.

This white paper should not be viewed as a definitive plan, but rather as an exploration of promising avenues. As such, the purpose of this white paper is twofold: first, to invite constructive challenge and refinement of the ideas it presents, and second, to help inform a prioritised programme of work that RECCo can take forward collaboratively with REC Parties, the Performance Assurance Board, and other stakeholders. Responses to this consultation will directly shape our business case development, governance proposals, and forward work planning for 2026/27 and beyond.

We look forward to receiving your views.

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Chapter 1 – Incentives

Background

While energy theft has some similarities to theft from physical retailers such as supermarkets, there are some differences which may reduce incentives to tackle it. Firstly, it is largely hidden from view, with a perceived lower risk of being caught and little or no opportunity for intervention. Secondly, physical retailers may have to absorb losses from stolen goods, while the cost of energy theft is spread across bill-paying consumers.

In electricity, stolen energy contributes to the Group Correction Factor (GCF)[1], which adjusts metered volumes of electricity to match the volume entering the distribution network. The volume of undetected theft is therefore distributed across all meter points, with its cost allocated to electricity suppliers and passed through to consumers. The gas industry similarly distributes the cost of stolen energy through the allocation of Unidentified Gas (UIG) within the settlement process.

In contrast to the shared cost approach to stolen energy, suppliers individually bear the expense of investigating theft cases. This creates a disincentive to pursue investigations. It is this disincentive that Ofgem originally sought to tackle through the introduction of the Theft Detection Incentive Scheme (TDIS).
The design of TDIS involved setting a target detection rate for each supplier and applying volume-based charges and credits according to their relative performance. A supplier who found more theft than expected would receive a financial reward; those who underperformed would pay into the incentive pool.

Recent TDIS changes

The Theft Detection Incentive Scheme (TDIS) remains based on principles established nearly a decade ago following Ofgem's review of energy theft arrangements. Under its current design, the scheme primarily rewards Energy Suppliers for identifying Confirmed Energy Thefts, with the value of those rewards partly determined by performance relative to peers. However, this approach has not consistently incentivised all Suppliers to proactively investigate potential theft. A key barrier appeared to be the financial uncertainty - Suppliers must bear the cost of investigations with no guarantee of reimbursement unless a theft is confirmed, while the broader costs of undetected theft are socialised across the market.

REC Change Proposal R0173 will expand the scope of the TDIS to better reflect investigative effort. It introduces compensation for qualifying Desktop and Site Visit Investigations, even if they do not result in a confirmed theft. This should give Suppliers more confidence in recouping costs, encourage earlier intervention.

In addition, the change mandates that Suppliers provide outcome feedback on all **Energy Theft Tip-Off Service (ETTOS) referrals**. This will support continuous improvement of a shared service funded by all Suppliers and help deliver safer, more efficient outcomes for consumers.

R0173 was initially intended for implementation on 1 April 2025. However, following a send-back to the Change Panel, the proposal was not approved until 2 May 2025. As Ofgem's decision did not specify an alternative implementation date, the Code Manager raised a subsequent Change Proposal (R0259) to revise the implementation date to 1 October 2025. The Change Panel is scheduled to vote on R0259 on 15 July 2025.

The Theft Target Methodology (TTM) sets out the level, distribution and value of theft targets and overall size of the incentive pots. Following the implementation of REC change R0091[2], the TTM has been set out in a Category 3 document managed by the Code Manager, consulting each autumn on changes to the TTM that may be given effect at the start of the following scheme year, i.e. 1 April the following year. However, as noted in the R0173 change report, a complementary change will be required to the TTM to introduce the 'multipliers' for the Theft Detection Value (TDV), allowing for a percentage of the TDV to be payable depending on the type of investigation carried out, as follows:

[1] See: Grid Supply Point (GSP) Group Correction
[2] R0091: '*Clarifications to the Theft detection Incentives Scheme'*

- Site Visit Investigation: 50% of TDV is payable.
- Desktop Investigation of an ETTOS lead: 20% of TDV is payable.

These payments apply only to qualifying investigations that do not result in a Confirmed Energy Theft but still meet the evidential and procedural standards set out in the REC. For cases that *do* result in a Confirmed Theft, suppliers receive 100% of the TDV.

Given the timing of these changes, we consider that they should be allowed to bed in and be assessed before any further substantive changes are made to the TTM. We therefore intend to limit any further changes to the TTM for the 2026/27 TDIS reporting year to be limited to:

- an inflationary adjustment to TDV; and
- any adjustment to theft targets to better reflect the prevailing split of smart and non-smart meters.

There may also be updates to the Performance Assurance Reporting Catalogue which would be progressed through a separate Category 3 consultation.

Performance Assurance Board actions

Ofgem's decision letter on R0173 highlighted the importance of strengthened governance and assurance, emphasising the need for the Performance Assurance Board (PAB) to oversee the scheme's effective operation. In its decision, Ofgem explicitly called for "integrated checks and increased reporting procedures" to verify the legitimacy of claimed costs and ensure suppliers uphold investigation standards. It also stressed the need for mechanisms to detect and respond to underperformance. This reflects a broader expectation that the REC's assurance framework will ensure value for money, drive improvement, and protect consumer interests.

The Code Manager is committed to working closely with the PAB to implement these expectations. This may include specific supplier reporting and carrying out targeted assurance activities. These steps will provide transparency and accountability while enabling the PAB to take proportionate action where necessary.

Reasonable Endeavors Scheme

We propose that the RES be retained and modernised—not as a standalone framework, but as a complementary support mechanism to the Theft Detection Incentive Scheme (TDIS). The TDIS already provides financial incentives to suppliers for undertaking standard investigations but does not account for atypical or high-cost cases. By contrast, a reformed RES could provide a targeted route for claiming exceptional costs not ordinarily recoverable through TDIS. Examples might include:

- Complex investigations involving multiple sites, jurisdictions, or coordinated fraud schemes.
- Legal proceedings undertaken in the broader interest of the industry or to set useful precedents.
- High-cost investigations undertaken at the request of the central Referral Assessment Service or ETU.

These costs—while not routine—can be critical to the overall theft reduction strategy. Without a route to recovery, suppliers may hesitate to pursue such cases. A repurposed RES, potentially administered via RECCo or codified under the REC, could ensure that these important but less commercially viable actions are still pursued, thereby closing a strategic gap in the incentive landscape.

As such, RECCo invites views on whether stakeholders would support the development of a revised RES – to be taken forward as Issue 0175 - that aligns with the REC's objectives, operates alongside the TDIS, and supports the effectiveness of central services like the ETU. Feedback is also sought on governance, eligibility criteria, and assurance arrangements that would be required to ensure value for money and appropriate use of industry funds.

Reflecting Theft in Settlement – gas

To ensure that gas theft is accurately reflected within settlement processes, the REC and Uniform Network Code (UNC) have been aligned through complementary code changes. Specifically, REC Change Proposal R0091[3] and UNC Modification 0734S[4] introduced a requirement for Confirmed Energy Theft cases to be reported to the Central Data Service Provider (CDSP).

This reporting obligation strengthens transparency across market arrangements and supports more accurate attribution of Unidentified Gas (UIG) volumes. It also ensures that theft data—once identified and confirmed—is properly accounted for in central systems, enabling the true cost of theft to be considered in balancing and reconciliation.

Reflecting Theft in Settlement – electricity

Elexon has raised Issue 117: 'Incentivising Correction of Settlement Post-Theft' with the aim of ensuring that energy theft is properly reflected in settlement processes. This is a key consideration in managing Risk 018 to Supplier Volume Allocation (SVA): Revenue Protection volumes are not settled.

While the Issue 117 group has only recently been formed, we see no reason in principle why the reporting gap could not be closed simply by bringing the reporting of electricity theft into line with gas, i.e. adding Elexon to the list of recipients of confirmed theft data alongside the DNs currently listed in Schedule 7.

Considerations

The financial exposure of suppliers to gas and electricity settlement charges can have a significant influence on theft reporting behaviours. In the gas market, the Reasonable Endeavours Scheme was initially introduced as a mechanism to mitigate this exposure—particularly where a theft investigation results in a confirmed theft that affects retrospective settlement positions. The scheme was designed to encourage reporting by reducing the disincentive posed by settlement liabilities.

Although RECCo's current focus is on developing mechanisms to offset the exceptional costs of complex or strategic theft investigations, there is a strong case for exploring whether a future REC-based claims process could also include the mutualisation of settlement costs in certain circumstances. This would provide parity with gas market mechanisms and further remove barriers to proactive investigation.

There is precedent for such an approach beyond the TDIS. For example, UNC Modification 429[5] allowed for the socialisation of costs arising from customer settlement error claims beyond the established code cut-off period, recognising the value in correcting systemic issues and avoiding undue burden on individual shippers.

Consideration should therefore be given to whether a targeted, conditional mechanism could be established under the REC to address analogous settlement exposures—especially where industry-wide benefits can be demonstrated. This could also support the strategic objectives of the Referral Assessment Service and the Energy Theft Unit by facilitating and de-risking complex, multi-party investigations.

Further analysis should also be undertaken to assess whether the existing mechanisms for allocating the cost of energy losses—such as the Group Correction Factor (GCF) in electricity and Unidentified Gas (UIG) allocation in gas—could incorporate performance-based weighting. Specifically, consideration could be given to whether suppliers' relative performance in settling consumption against actual meter readings, investigating theft, or addressing other known sources of allocation error might reasonably inform the distribution of these residual costs. Introducing even a modest weighting in the allocation formulas could materially increase the financial incentive for suppliers to take corrective action, without requiring the injection of new funds into a separate neutral incentive pool such as the TDIS. This could offer a more systemic, self-correcting method of driving market improvements aligned with efficient settlement outcomes.

[3] R0091: 'Clarifications to the Theft Detection Incentive Scheme'
[4] UNC0734S: 'Reporting Valid Confirmed Theft of Gas into Central Systems and Reporting Suspected Theft to Suppliers'
[5] UNC429: 'Customer Settlement Error Claims Process'

Chapter 2 – Leveraging Smart Data and analytics

1. Introduction and Strategic Context

The detection and mitigation of energy theft has become increasingly complex due to evolving consumption patterns, decentralised metering systems, and limitations in traditional detection methods. In line with its obligations under the REC, and recognising the opportunity to modernise its approach, RECCo commissioned a strategic study to assess the practicality of deploying advanced analytics—particularly using smart meter data—to improve theft detection.

This work builds on the original mandate to explore a centralised Theft Risk Assessment Service (TRAS) but recognises that the energy market has shifted since those requirements were first set by Ofgem. Many suppliers now operate sophisticated internal analytics tools. As a result, RECCo is examining whether the original requirement for a central service remains appropriate, or whether the focus should now shift to supporting Parties through common methodologies, data access protocols, and sector-wide best practice.

2. Aims and Methodology of the Capgemini Study

RECCo engaged Capgemini to deliver a robust, multi-phase programme of research, combining advanced statistical analysis, hypothesis testing, and machine learning. The project sought to determine:

- Whether smart meter data—such as reads and tamper alerts—can reliably signal energy theft.
- The feasibility of centralised versus decentralised theft detection models.
- How socioeconomic factors might influence or predict theft behaviours.
- The technical and legal barriers to using smart meter and demographic data for enforcement purposes.

The study involved modelling, historical data analysis, industry interviews, and alignment with regulatory frameworks, including data protection standards.

3. Findings from the Data Analysis

3.1 Mathematical and Statistical Techniques

The study demonstrated that statistical tools like **Benford's Law** can flag anomalies across large meter groups but are not reliable for detecting individual cases. Game theory and likelihood testing performed better in identifying suspect behaviour at the meter level, especially when used as a second-phase filter.

3.2 Smart Meter Alerts

Analysis of tamper and system alerts revealed certain patterns—such as weekend spikes or specific rare alert types (e.g. 8F74: meter cover removed)—that align with confirmed theft. However, data quality was a major issue. Nearly 99% of alerts lacked timestamps, limiting their predictive use.

3.3 Socioeconomic Indicators

Capgemini found positive correlations between energy theft and areas with high economic inactivity, as well as surprising links with education levels. Theft was also more common in colder months. These findings suggest that energy theft is driven not just by technical opportunity but by behavioural and socioeconomic factors.

3.4 Machine Learning Models

Two models—clustering (K-means) and classification—demonstrated that even incomplete datasets can be used to identify emerging theft patterns. The classification model achieved 75% recall, highlighting the potential for predictive models to complement existing enforcement approaches.

4. Legal and Policy Implications

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The Capgemini study and RECCo's ongoing work have both concluded that **data access remains the biggest barrier** to scaling smart meter-based theft detection. While RECCo can, in theory, process data under *legitimate interest*, suppliers remain hesitant to share personal consumption data without clearer legal mandates.

Opportunities are emerging through the **Data Best Practice as a Code Obligation**[6] and the proposed **Smart Data Repository** being developed by Elexon[7]. In parallel, RECCo is engaging with the **SEC Privacy Sub-Committee** to explore the basis for a formal inter-code data sharing arrangement that clarifies the lawful basis for processing data for theft prevention under GDPR public task principles.

5. Recommendations and Next Steps

RECCo will now take the following steps:

- **Publish the Capgemini report in full** for stakeholder review.
- **Develop a business case** presenting three options:
    a) **Do nothing**, recognising that central support may no longer be required.
    b) **Enable Parties**, through shared methodologies, tools and templates.
    c) **Create a central lead-generation service**, if data access can be secured.
- **Continue engagement** with Ofgem, DCC, suppliers, and the Performance Assurance Board to design a shared framework for data-driven theft detection.
- **Raise code modifications** under REC and SEC to **codify lawful data sharing** for theft prevention.
- **Consider a further Pilot and operationalise validated models**, starting with a small number of engaged suppliers.

We intend to progress the business case and any associated governance changes throughout the remainder of 2025/26, taking into account the outcomes of stakeholder consultations. These findings will inform our forward work planning for 2026/27 and beyond.

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[6] "Data Best Practice as a Code Obligation" Ofgem, June 2025
[7] "Data Repository Update" Elexon, June 2025

Chapter 3 – Theft Detection Resolution Body

Introduction

In May 2024 ICOSS raised Issue I0176 Creation of an Energy Theft Detection Resolution Body (TDRB). They presented proposed business rules for this service at the October Theft Issues Group Meeting, which are summarised at a high level below. It proposes that the TDRB would be a RECCo centrally provided REC service responsible for fulfilling the Supplier's obligation to investigate suspected theft and determine the quantity of gas and/or electricity that has been stolen to correct energy settlement.

Some REC Parties have raised concerns regarding the proposal, in particular the default opt in position with a requirement to demonstrate they operate a theft investigation service that as a minimum meets the same standards as the TDRB. There is also a question on if the service is needed given that there are service providers than are willing to provide zero volume contracts with a service that meets, as a minimum, the obligatory requirements but with additional services available if required. If the service is not required or utilised sufficiently by the industry there is a concern that unnecessary costs will be incurred by Suppliers (and ultimately their customers) that currently have a fully formed service in operation and would not wish to utilise the TDRB.

To address some of these concerns and explore the feasibility of such a centrally provided service RECCo have reviewed the proposed Business Rules and would like to table alternative options for consideration.

Summary Business Rules

- BR01 - REC would be responsible for procuring the TDRB and running the service
- BR02 - The TDRB would be available to all licensed Energy Suppliers on an equal, fair and transparent basis

Opt in / Opt out

- BR03 - All Energy Suppliers would initially be "Opted-in' to the Service. Suppliers could "Opt-out' where they do not wish to use the TDRB and can demonstrate that they (or their agents) operate a service which operates to at least the same standards as the TDRB.
- BR04 - Suppliers would either be 'Opted in' or 'Opted-out' for all of their Energy Theft Investigations.

The TDRB Service

- BR05 - The TDRB carries out Theft Investigations on behalf of the Supplier as their agent.
- BR06 - 'Opted-in' suppliers would identify potential theft instances and send a Lead Notice to the TDRB.
- BR07 - The TDRB initially carries out a Desk Top Exercise followed by a Full Theft Investigation where required.
- BR08 - The TDRB Theft Investigation concludes with the TDRB producing a Theft Investigation Report.
- BR09 - The Supplier would be responsible for correcting energy settlement.
- BR10 - The Supplier would be responsible for the operation of the TRAS scheme including TRAS reporting.
- BR11 - Monitoring of the Standards of the TDRB and 'Opted-out' suppliers would be overseen by PAB

Funding and Charging

- BR12 - The cost associated with setting up the TDRB and de-minimus running costs would be met through a marginal uplift to annual REC charges on a Meterpoint basis.
- BR12 - Different levels of transactional charges would apply to each investigation case undertaken by the TDRB.

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Background and rationale

The I0176 proposal seeks to address longstanding concerns over inconsistency in how energy theft investigations are conducted across suppliers, particularly where some lack the resources or capabilities to meet their obligations effectively. Under existing arrangements, suppliers are individually responsible for detecting and investigating theft. These arrangements rely on robust investigations, but the quality and completeness of those investigations vary, potentially limiting enforcement outcomes.

I0176 proposes the establishment of a central TRDB to act on behalf of suppliers by receiving leads, undertaking desk and field investigations, and issuing standardized reports. The model includes a default opt-in with the option to opt out for suppliers that can demonstrate equivalent internal processes. Proponents argue that the TDRB would enhance impartiality, drive consistency, and ensure all suppliers can access high-quality investigation services, thereby improving fairness under the Theft Detection Incentive Scheme (TDIS) and enabling systemic theft detection. However, other stakeholders are concerned about cost duplication, market distortion, or redundancy given existing private service options.

Alignment with REC Mission Statement and Objectives

As this change involves a mandatory provision and elective use of a service that is currently provided by other market participants, it is likely that a REC change proposal to introduce this requirement would be sent to Ofgem for approval. As such, it must be measured against the code's mission and objectives (as set out in energy supply licence conditions) rather than on a business case alone.

Standard Condition 11B.6 of the Electricity Supply Licence (and the equivalent Gas licence condition 11.6) defines the REC Objectives as follows:

a) *"to ensure the REC operates and evolves in a manner that facilitates the achievement of its mission statement"*;
b) *"to ensure customers' interests and data are protected in the operation of the REC"*; and
c) *"to drive continuous improvements and efficiencies in the operation of the REC and the central systems and communication infrastructures it governs"*.

The **REC Mission Statement** itself is: *"The REC will facilitate the efficient and effective running of the retail energy market, including its systems and processes. It will promote innovation, competition and positive consumer outcomes"*.

Mission Achievement (Objective a):

- **Supporting Licence Compliance**: The TDRB is designed to provide consistent, high-quality investigations, which could help suppliers—especially smaller ones—fulfil their statutory duties under licence Condition 12A. This is particularly relevant where suppliers currently lack access to experienced field or desk-based investigative resources.
- **Improving Data and Evidence Quality**: By standardising theft case evidence, the TDRB could enhance the quality of referrals to the ETU via the RAS, potentially increasing successful outcomes and reducing administrative burdens on individual suppliers.
- **Facilitating Fair Incentives**: A centralised, impartial approach could reduce variability in performance under the TDIS, allowing all suppliers a fairer opportunity to benefit from incentives, consistent with Ofgem's policy goals.

Potential Conflicts or Concerns:

- **Risk of Redundancy**: Critics argue that many suppliers already fulfil their obligations through existing in-house capabilities or commercial providers. Mandating use of a central TDRB could risk duplicating effort or undermining established, effective approaches—potentially conflicting with principles of proportionality and efficiency.

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- **Competition and Innovation**: A centrally procured TDRB might reduce the incentive for suppliers to innovate or invest in their own detection strategies, potentially stifling the evolution of theft prevention methods.
- **Blurring Governance Roles**: If RECCo were to host or procure the TDRB, questions arise around its neutrality under future Code Manager licensing arrangements. This may create perceived or actual conflicts between its governance and delivery roles.

Protecting Customers' Interests (Objective b):

- **Levelling the Playing Field**: Smaller or resource-constrained suppliers often lack the specialist skills or partnerships to carry out thorough theft investigations. A central TDRB could ensure these parties are not competitively disadvantaged in their ability to meet theft obligations, reducing disparities and promoting fairer participation in the market.
- **Lowering Barriers to Entry**: By providing a readily accessible investigation service, the TDRB could reduce the compliance burden on new entrants, supporting innovation and diversity in the market. This aligns with Ofgem's aim to promote ease of entry and exit in retail energy.
- **Enabling More Accurate Cost Recovery**: If theft is more consistently identified and dealt with, it could reduce the need for cost mutualisation across all consumers, improving price transparency and supporting competition on merit.

Potential Conflicts or Concerns:

- **Market Distortion**: Some stakeholders argue that a centrally funded or mandated TDRB could crowd out existing private service providers, reducing the scope for commercial differentiation and innovation in theft detection practices.
- **Incentive Misalignment**: If suppliers perceive the TDRB as a default or low-effort route to compliance, they may be less incentivised to invest in their own competitive or proactive theft strategies. This could reduce long-term dynamism in the market.
- **Impact on Micro Business Focus**: While the TDRB may support household-focused detection, it is unclear whether the model would extend effectively to the more bespoke requirements of Micro Business Consumers—where site diversity and contractual complexity may demand tailored approaches.
- **Stakeholder Viewpoints**: One respondent noted, *"We do not support the centralisation of investigation services; it risks weakening supplier accountability and does not reflect the maturity of some providers' existing partnerships."* Another commented, *"A shared service may make sense for complex or multi-party cases, but not as a default."*

Continuous Improvement and Efficiency (Objective c)

- **Standardisation of Investigation Practices**: A centralised service could reduce fragmentation by applying consistent standards in theft investigation, reporting, and evidence handling. This may simplify interactions with emerging services such as the RAS and the ETU, improving the efficiency of the end-to-end process.
- **Administrative Efficiency for Smaller Suppliers**: For suppliers without internal investigation capacity, the TDRB could reduce operational burden and procurement overheads, allowing them to discharge their theft obligations more easily and cost-effectively.
- **Support for Complex Cases**: In cases involving multiple sites or multiple suppliers, a shared TDRB resource may be more efficient than duplicative parallel investigations—potentially simplifying coordination and reducing duplicated site visits or reporting lines.

Potential Conflicts or Concerns:

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- **Risk of Governance Complexity**: Introducing a new central function could add governance layers, particularly if participation, funding, oversight, and reporting arrangements are not tightly defined. As one stakeholder noted, *"Creating a central body risks introducing more complexity, especially if roles and responsibilities overlap with RAS, ETU, or existing supplier arrangements."*
- **Duplication of Effort**: Suppliers who already maintain their own investigative capabilities may view a central service—especially if funded via REC—as duplicative and inefficient. This could create friction unless there is an opt-out mechanism or modular access model.
- **Procurement and Oversight Costs**: Establishing and managing a central service introduces overheads—both for RECCo (as the coordinating body) and for industry participants, who may bear increased assurance or audit burdens to demonstrate compliance or opt-out eligibility.
- **Conflict with Simplification Goals**: Several stakeholders cautioned that, without clear scoping, the TDRB could contribute to governance sprawl. One put it succinctly: *"It's not clear what gap this fills. If we're aiming for code simplification, adding more services may not help."*

1. **From Mandated to Modular Participation**	
Issue Raised:	Possible Variation:
Some stakeholders were concerned that a centrally mandated service could duplicate existing supplier capabilities, distort competition, or add unnecessary cost and governance complexity.	Adopt a **modular, opt-in model**, where the TDRB is made available as a shared industry resource but is not the default route for all suppliers. Participation could be: • **Voluntary**, with clear entry and exit criteria. • **Outcome-tested**, where suppliers may opt out if they can demonstrate equivalent capabilities through assurance. • **Tiered**, offering distinct service levels (e.g. triage-only, full investigation, or report preparation) to suit differing supplier needs.
2. **Focus on Complex or Cross-Supplier Cases**	
Issue Raised:	Possible Variation:
Some respondents questioned whether a market failure exists for standard theft cases, but acknowledged gaps in handling **multi-site**, **multi-supplier**, or **disputed-ownership** investigations.	Reposition the TDRB as a **specialist escalation service** for complex cases, particularly where: • Multiple Meter Points or sites are involved. • Site responsibility is unclear or disputed. • Multiple Suppliers are implicated. • Third-party enforcement support is required (e.g. police liaison or legal coordination). This variant avoids duplicating routine supplier operations, while addressing a genuine coordination problem.
3. **Clarify Boundaries with other Services (ETU / RAS)**	
Issue Raised:	Possible Variation:
Concerns were raised about potential overlap or confusion between the TDRB and the roles of the Energy Theft Unit (ETU) and the Referral Assessment Service (RAS).	Maintain the TDRB as a **distinct pre-referral service**, focused on standardising investigation input to improve ETU/RAS outcomes. This could include: • Performing robust desktop or field-level investigations. • Applying common standards to evidence collection. • Generating referral-ready reports that improve acceptance rates by ETU/RAS. By acting as an **upstream enabler**, the TDRB would complement rather than duplicate the functions of ETU/RAS.
4. **Neutral Hosting and Avoidance of Conflict**	
Issue Raised:	Possible Variation:
RECCo's forthcoming role as the licensed Code Manager raises concerns about potential conflicts	Ensure the TDRB is:

of interest if it were also to operate or procure market services.	• **Procured via a competitive, transparent process**, not delivered by RECCo directly. • Subject to **separate governance** from code management activities. • Overseen by the **Performance Assurance Board** or Theft Issue Group to maintain neutrality. Alternatively, RECCo could act as a facilitator of access to a **panel of accredited third-party providers**, from which suppliers can choose according to their needs.
5. **Outcome-Based Service Design and Evaluation**	
Issue Raised:	Possible Variation:
Stakeholders noted that the value of the TDRB would depend on measurable outcomes—such as ETU referral acceptance rates, theft detection volumes, or case progression speed.	Build in **performance tracking and sunset clauses**, such that: • The TDRB is piloted initially with performance KPIs. • The service is retained only if it demonstrably improves theft outcomes, increases efficiency, or reduces costs. • Cost-recovery is based on usage or referral success, not flat levies. This ensures accountability and responsiveness to actual market value.
6. **Flexible Funding Models**	
Issue Raised:	Possible Variation:
Concerns over cross-subsidisation—particularly if a central service is funded through REC charges but not used by all parties.	Consider hybrid models such as: • **Pay-per-use**, where only users fund the service. • **Minimum core funding** via REC for essential coordination functions, with enhanced services available on a commercial basis. • **Co-investment with suppliers**, aligning incentives to use the service efficiently.

Conclusion

Stakeholder feedback indicates that the original problem statement—concerning the lack of revenue protection service providers willing to operate at low volumes—may no longer be valid. One provider confirmed that they are prepared to undertake investigations on a **per-job basis**, suggesting that services are available even to smaller or less frequent users. However, such arrangements may not address broader concerns around **cost-efficiency or economies of scale**.

That said, a number of **variations to the original I0176 proposal** could still preserve its core objective: to improve the consistency, quality, and effectiveness of theft investigations across the market, while addressing concerns around **cost, competition, and governance** as set out above
RECCo invites stakeholder views on whether such an **alternative, modular TDRB model** could deliver a net benefit to the market and welcomes feedback on the proposed design principles outlined above.

Chapter 4 – Inspections

Background

Historically, the GB energy market operated under a mandatory two-yearly meter inspection regime, enshrined in the Gas and Electricity Supply Licence. This approach served multiple purposes: deterring theft, identifying unsafe meter installations, and maintaining the integrity of billing systems. However, in 2016, Ofgem repealed this obligation, citing increased smart meter rollout, strengthened safety and billing accuracy obligations, and an intention to move towards a more proportionate, risk-based approach.

Ofgem's decision was underpinned by the belief that suppliers could better target inspections based on their own risk profiles. The shift aimed to reduce unnecessary costs and avoid duplicative regulatory oversight. Yet, as noted in Appendix 4 of the *Police Partnership Outline Business Case*[8], the withdrawal of a cyclical inspection requirement has coincided with a significant fall in energy theft prosecutions, raising questions about the effectiveness of the uncoordinated risk-based regimes that followed.

Impacts of Removing Biennial Inspection Obligations

The removal of a mandatory inspection framework has produced two notable effects:

1. **Detection and Prosecution Gap**: Prosecutions for electricity abstraction have reportedly dropped by over 90% since the removal of mandatory inspections. Despite smart meter deployment, overall theft detection rates remain well below target, with confirmed thefts at just 52% of the industry-wide goal for 2023/24.
2. **Inconsistent Risk-Based Approaches**: Although Ofgem envisioned that suppliers would adopt and share their own targeted inspection policies; this has not materialised. There is currently no requirement for suppliers to publish their methodologies, nor any formal mechanism for cross-industry coordination or oversight.

In contrast to other regulated sectors, the absence of a common framework means theft risk is not being systematically assessed or addressed, undermining both consumer safety and system integrity.

International Benchmarks and CNAIM Comparisons

Globally, many jurisdictions have retained some form of mandatory inspection, even as smart technologies advance:

- **United States**: State-level regulators often require inspections every 5–10 years, with formal asset plans submitted for approval.
- **European Union**: Member states generally enforce at least annual reads and periodic re-certification, especially where smart coverage is incomplete.
- **Australia**: The Australian Energy Market Commission's 2025–30 regulatory plan retains legacy inspection and validation obligations until full smart meter transition is achieved.

These regimes reflect a shared view: physical inspections remain relevant—especially when integrated with modern risk-based prioritisation.

A domestic example of this principle is the Common Network Asset Indices Methodology (CNAIM), mandated under Standard Licence Condition 51 of the Electricity Distribution Licence. CNAIM is a structured system used by Distribution Network Operators (DNOs) to assess the condition and risk level of key electricity assets—such as cables, transformers, and switchgear. By scoring each asset based on factors like age, condition, and criticality, CNAIM helps DNOs make informed decisions about when to maintain, replace or upgrade

[8] "Proposal to create a new energy theft enforcement service in partnership with the City of London Police", RECCo, November 2024

equipment. This improves reliability, reduces the risk of outages, and ensures spending is focused where it delivers most value.

CNAIM enables DNOs to:

- Quantify asset risk using data on age, usage, and probability of failure.
- Prioritise actions based on safety, environmental, financial, and network impact.
- Report performance consistently to Ofgem and allow benchmarking across companies.

This framework has driven more efficient, risk-based investment planning under the RIIO price control and could offer a valuable model for developing a coordinated, risk-led approach to meter inspections.

A Coordinated Industry Proposal

A new framework for meter inspection, grounded in risk-based principles and reinforced by transparency, consistency, and central oversight could be introduced into the REC.

1. Supplier Risk Policy Disclosure

Suppliers would be required to share their internal inspection strategies with the REC Performance Assurance Board (PAB). This would allow PAB to:

- Review for completeness and consistency.
- Identify good practices and gaps.
- Promote alignment where risk patterns overlap (e.g. meter types, theft hotspots, change-of-tenancy events).

This approach would not constrain supplier autonomy but would introduce a degree of cross-industry scrutiny, mirroring CNAIM's role in the network sector.

2. Development of a Risk Scoring Framework

An industry working group, convened by RECCo, would design a standardised risk matrix to guide inspection and due diligence prioritisation. While traditionally focused on asset condition, the framework would take a broader view of risk, drawing lessons from methodologies like CNAIM and incorporating insights from fraud detection practices.

In addition to core asset-related indicators—such as meter age, type, and installation history—the framework could include other data-driven signals that have been associated with energy theft and tampering, including:

- Tamper alerts or sustained consumption anomalies.
- High frequency of change of occupancy at a premise.
- Repeated tip-offs or prior evidence of meter interference.
- Geographic clustering of confirmed thefts or flagged risks.

These inputs would support proactive monitoring and allow incoming suppliers to identify where enhanced due diligence may be appropriate during customer acquisition—such as requesting a site inspection or validating metering data before accepting the premise into portfolio.

To ensure compliance with data protection legislation, particularly regarding the handling of sensitive personal data, the risk matrix would be designed to focus on premise-level indicators and depersonalised risk attributes. For example, it would avoid profiling individuals based on income or demographic traits but could reference postcode-level trend data where appropriate and anonymised.

The intention is not to prescribe supplier actions or outcomes, but to support consistent, transparent triage across the market. It would allow industry and oversight bodies such as the REC PAB to identify outlier

behaviours, coordinate effort, and share learning on emerging fraud patterns. This cross-industry visibility would also enable more targeted deployment of resources, aligned with the risk-based principles that underpin successful regulatory frameworks.

3. Industry-Wide Reporting

A new REC Schedule could require suppliers to report:

- Number and category of inspections undertaken.
- Detection rates by risk class.
- Safety or tampering issues found and resolved.

Data would be anonymised, but benchmarkable, enabling PAB to identify underperformance and coordinate targeted audits or interventions.

4. Inspection Cost Recovery and Tariff Cap Alignment

Suppliers often cite cost uncertainty as a barrier to proactive inspections. To address this, we propose that eligible inspection costs—those demonstrably based on risk and in line with an agreed national methodology—be classified as "policy costs" within Ofgem's default tariff cap.

This would:

- Remove financial disincentives to undertaking inspections.
- Create a stable funding environment.
- Ensure equity between suppliers undertaking rigorous inspections and those who do not.

Conclusion

The original policy intention behind Ofgem's 2016 reform - to replace blanket inspections with smart, risk-led alternatives - remains valid. However, the absence of an enforceable or coordinated framework has hindered progress. Prosecutions are down, risks remain under-addressed, and suppliers lack incentive alignment.

By introducing a coordinated, transparent, risk-based inspection regime - modelled on successful regulatory tools like CNAIM and bolstered by appropriate cost recovery - could be a vital part of our theft reduction and consumer protection toolkit.

We welcome stakeholder views on the proposed framework and its alignment with existing obligations under the REC and licence.

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Chapter 5 – The Objections process

Background

The energy market's switching framework is designed to encourage consumer engagement and promote competition. However, it can inadvertently hinder the effective detection and prosecution of energy theft. In particular, the ability of consumers to switch supplier during the course of a theft investigation creates a significant enforcement loophole.

Perpetrators can, and do, exploit this loophole. Ofgem has publicly acknowledged that switching is a known method used to avoid detection, stating that:

> "A known method to avoid detection is for perpetrators to switch suppliers when suspicion of theft arises… Suppliers currently have no mechanism to stop these consumers from switching".[9]

This results in the investigation being effectively terminated at the point of switching, as current licence conditions do not compel the previous supplier to continue investigations once the meter is no longer in their portfolio. Furthermore, without cross-supplier visibility, the gaining supplier may be unaware that any concern exists.

Revisiting the Role of Objections

The role of objections in the theft process has been raised in past consultations. Ofgem's consultation on *REC v1.1* in 2020 included a proposal to allow objections on the basis of an active theft investigation. Stakeholders were broadly supportive in principle, recognising the need for performance assurance oversight, although there were concerns about inadvertently alerting the consumer under investigation.

A proposal was made to introduce this new valid reason for objection via a minor amendment to Standard Condition 14 of the electricity and gas supply licences. While this was not progressed at the time, it remains a relevant and proportionate mechanism to close an existing enforcement gap.

The Performance Assurance Board has recently highlighted the need to revisit the objection framework. In its June 2025 report to the RECCo Board, the PAB recommended that a new project be added to the Forward Work Programme to review the switching objections process more broadly. Although this was intended to address switching eligibility and consumer experience, the scope could naturally encompass theft-related objections.

A Targeted Proposal

We propose that a new valid reason for objection be added to supplier licence conditions, along the lines of:

> **"An ongoing and time-bound theft investigation, supported by evidence and conducted in line with established REC Practice."**

This would:

- **Enable suppliers to complete investigations** before a consumer can move supplier and potentially evade enforcement.
- **Improve detection and deterrence** of organised and repeat offending.
- **Support the ETU and RAS** in maintaining continuity of evidence across supplier portfolios.
- **Be strictly limited and time-bound**, consistent with REC best practice, and subject to extension only where theft is proven and recovery of debt is being pursued.

[9] "R0233: Introduction of an Energy Theft Unit (ETU) under the Retail Energy Code (REC)" decision letter, Ofgem June 2025

Crucially, the use of this objection would be subject to governance and oversight by the REC PAB, with reporting requirements and escalation routes to prevent misuse or excessive blocking of legitimate switches. The objection reason itself could be coded neutrally to avoid alerting the consumer directly.

Conclusion

The framework within which energy theft enforcement is undertaken has evolved significantly in recent years, with the creation of the REC PAB, new switching arrangements and in due course the ETU and RAS establishing a robust backbone for investigative action. However, these mechanisms can only succeed if suppliers are able to preserve investigative continuity in the initial stage.

We recommend that Ofgem give renewed consideration to introducing a theft investigation–based objection reason, subject to the safeguards and oversight described above. Doing so would represent a proportionate and necessary enhancement to the market's collective ability to deter and respond to energy theft.

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Chapter 6 – Trialling efficacy of repeat offence disruption

Although industry-led enforcement and awareness campaigns have achieved notable successes, the absence of robust evidence on the prevalence and drivers of **repeat tampering** limits the effectiveness of long-term deterrence strategies. Unlike other regulated sectors where reoffending rates are a well-established metric, there is currently no reliable baseline within the energy sector for understanding the incidence of repeat meter interference in domestic or microbusiness premises.

While a detailed dataset capturing repeat offending would ideally draw on case histories across suppliers, regulators and law enforcement, such data remains fragmented and inconsistently recorded. In the absence of such a dataset, the potential exists to generate high-quality evidence through the **targeted use of field trials** designed to measure recidivism and the relative effectiveness of various intervention strategies. One such approach would be a **Randomised Control Trial (RCT)** involving structured follow-up visits to premises where tampering has previously been confirmed.

This trial could also be used to compare the effectiveness of a range of deterrence methods, such as:

- Issuing cease-and-desist letters following the first confirmed offence.
- Educating consumers on the use of smart meter tamper alerts and the consequences of reoffending.
- Testing alternative physical deterrents, including modified meter boxes and secure enclosures.

This approach would not only establish a statistical basis for understanding reoffending but would also offer insights into the cost-effectiveness of different mitigation techniques, helping to inform future policy and operational responses.

Trial Design and Methodological Considerations

The proposed RCT would follow a standardised methodology, stratifying trial groups by geography, offence severity, and customer profile. Participating premises would be randomly assigned to one of several intervention arms or to a control group receiving standard enforcement. Interventions would be evaluated for their impact on rates of reoffending, with particular attention paid to:

- **Enhanced monitoring and follow-up inspections**
- **Consumer engagement and warning communications**
- **Physical tamper deterrents and technical enclosures**
- **Legal warnings and escalation protocols**

It is anticipated that a trial involving at least 200 premises would be required to produce statistically meaningful results, with higher numbers required if multiple interventions are to be compared in parallel. As per best practice in social policy and innovation trials, the trial would require clear protocols, independent oversight, and careful attention to randomisation and sample retention.

Cost and Benefit Considerations

The cost of running such a trial could include:

- Design and oversight of the trial framework.
- Site visits and inspections.
- Installation of any physical deterrents.
- Data analysis and reporting.

The benefits of any trial could include the development of:

- A baseline understanding of repeat offending behaviour.
- A quantified assessment of intervention effectiveness.
- Evidence to inform future policy, investment and industry-wide practices.
- Improved theft reduction outcomes through targeted deterrence.

Funding Framework and Innovation Principles

We believe that we could adopt principles in line with those of the **Strategic Innovation Fund (SIF)** reflecting key criteria for innovation funding, namely: the need for collaborative trials, the potential for replicable impact, and the alignment with core regulatory objectives (such as consumer protection, system integrity, and decarbonisation).

However, recognising that this is a smaller-scale trial than SIF typically supports, we propose a **hybrid funding model**, whereby:

- RECCo funds the design, operation, and reporting of the trial.
- Participating suppliers fund field execution and site visits, with costs recoverable through a mutualisation scheme – potentially the TDIS.
- Private sector innovation partners may contribute materials (e.g., tamper-resistant enclosures) at their own risk and in return for data on performance.

This model enables shared risk, promotes buy-in, and reduces total cost exposure for any single party—while aligning with the spirit of innovation and collaboration underpinning SIF.

Request for Stakeholder Views

We invite stakeholders to consider whether such a structured framework for the **trialling of targeted theft deterrence interventions**—and particularly for assessing reoffending behaviour—should be pursued. In doing so, we welcome views on:

- The proposed trial design and methodology;
- Which interventions are most likely to yield useful insights;
- The appropriateness of the proposed funding model;
- Whether a standing innovation or trial framework should be developed under the REC to support similar initiatives in future.

Feedback will inform RECCo's consideration of whether and how to further develop the framework for potential trials as part of the wider Theft Reduction Strategy and its future Forward Work Plan.

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Chapter 7 – Unlocking knowledge: a curated research library

The tools and techniques to prevent, detect, and investigate theft often remain dispersed across academic papers, consultancy reports, and isolated pilots. This fragmentation makes it difficult for practitioners to access and apply emerging insights.

A curated research library on energy theft is a proposed solution to bridge this gap. In simple terms, this would be an organized, continually updated repository of the best academic and professional research from around the world – all tailored for practical industry use. Such a resource would compile findings on what works (and what doesn't) in theft prevention and detection, translating complex research into accessible insights.

Such a library would support evidence-based decision making and foster innovation across the sector. It would simplify access to analytical techniques like machine learning, anomaly detection, and behavioural modelling—technologies increasingly shown to improve the targeting of investigations. Importantly, it would help suppliers, TPIs, and regulators identify proven approaches from other jurisdictions that could be adapted to the GB market.

Academic research in action

RECCo has already benefited from this kind of research-led innovation. In its **SMART Data project**, methods such as **Benford's Law** and **Stackelberg game modelling** were successfully applied to screen for anomalous consumption patterns and prioritise suspicious accounts. These techniques, derived from global academic work, were validated in a GB context and showed promise in improving the effectiveness of theft detection strategies.

Internationally, academic research continues to explore innovative solutions, including artificial intelligence and hybrid detection models using smart meter data. However, without a central repository, these insights risk going unnoticed or underutilised. A curated library would bridge this gap, translating complex research into actionable strategies for the GB energy market.

Commissioned research

To strengthen the practical relevance of this global knowledge base, RECCo could **periodically commission GB-specific research** or pilot programmes that test the applicability of international techniques under local market conditions. This two-track approach—combining international curation with domestic validation—would ensure that the research delivers real-world impact and supports ongoing improvement in theft prevention, detection, and investigation.

For example, in 2022 RECCo commissioned Capgemini to conduct the first robust estimate of theft levels in Great Britain in over a decade. This analysis calculated that undetected energy theft might total **up to 1069 GWh of gas and 2837 GWh of electricity per year**, equivalent to roughly **£1.4 billion in lost energy annually** (at Q3 2022 prices). That estimate has been referenced not only by RECCo but also by Ofgem and, we believe, has helped act as a catalyst for subsequent work on theft reduction. This underlines the value of rigorous, data-led methodologies in shaping strategy and regulatory policy.

Conclusion

A living research library, grounded in both international evidence and GB-specific trials, could serve as a powerful enabler of innovation and continuous improvement across the retail energy market. We would therefore welcome stakeholder views on whether RECCo should take forward this proposal as a formal part of its longer-term theft reduction strategy.

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Appendix 1 – Abstraction of electricity cases

The figures provided in the table below show prosecutions and convictions for 'Offence 43' in England and Wales, the Abstracting of Electricity under Section 13 of the Theft Act 1968. The theft of gas is not recorded as a specific offence and no equivalent figures are available.

In the five years 2011 to 2015 there were an average of 404 Abstracting Electricity cases brought.

With effect 1 April 2016 the standard conditions of the Electricity and Gas Supply licences were modified, removing the requirement for suppliers to inspect meters at least once every two years.[10] The expectation was that suppliers would instead use a risk-based approach. The removal of the two-yearly inspection obligation appears to correlate with a reduction in the number of prosecutions.

In the six years 2018 to 2023 there were an average of 56 prosecutions a year, an 86% reduction on the period prior to the licence modification.

Table 1: Outcomes of offence 0043 – Abstracting Electricity shown by Year – England and Wales (No equivalent offence code for gas theft available in reporting)[11]

Year Ending June	Proceeded against	Convicted	Sentenced
2011	435	408	432
2012	429	433	461
2013	393	375	428
2014	358	354	370
2015	405	361	367
2016	264	239	257
2017	159	167	186
2018	92	90	92
2019	69	66	67
2020	36	28	29
2021	56	46	41
2022	28	26	30
2023	49	18	18

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10 Notification to modify the standard conditions of the electricity supply licence. Ofgem, 2 February 2016
11 Source: Ministry of Justice figures - www.gov.uk/government/statistics/criminal-justice-system-statistics-quarterly-june-2023

Appendix 2 – Summary of academic papers

The following is a small selection of research papers relating to energy theft that RECCo has identified. In this appendix we provide a short summary of the synopsis and findings, and a link to the published paper. If the proposal to produce a curated library is taken forward, we would expect to publish an expanded summary, together with its relevance to REC processes, the GB market more generally and potential next steps.

Sample research

"A distributed intelligent framework for electricity theft detection using Benford's Law and Stackelberg game". Longfei Wei, et al. Conference Paper, September 2017

The paper suggest that a new layered detection framework would enable high-accuracy detection of electricity theft while managing false positives and optimising resource use. The layered detection model would first use **Benford's Law** to screen smart meter data for anomalies, then a **Stackelberg game-theoretic model** to simulate interactions between the utility and potential thieves for targeted verification.

Benford's Law is a mathematical rule that says in many naturally occurring sets of numbers, smaller digits (like 1 or 2) appear more often as the first digit than larger ones (like 8 or 9). For example, about 30% of the time, numbers will start with a 1. This pattern shows up in things like electricity meter readings, financial records, and population numbers. If data doesn't follow this expected pattern, it might be a sign something's wrong—like errors, fraud, or tampering—making Benford's Law a useful tool for spotting unusual or suspicious activity.

A Stackelberg game is a type of strategic decision-making model where one player (the leader) makes a move first, and the other player (the follower) responds after seeing that move. In energy theft detection, this can be used to model how a utility (leader) might design checks or penalties knowing that a potential thief (follower) will try to avoid being caught. It helps predict how someone trying to cheat might behave and lets the utility adjust its strategy to catch them more effectively.

As part of the Smart Meter Data project, RECCo commissioned Capgemini to test the hypothesis using GB consumption data. They applied Benford's Law as a first-layer screening method to highlight irregular consumption patterns and then used a hypothesis test, specifically the Likelihood Ratio Test (LRT), to quantify the probability that these anomalies indicated theft rather than benign variance. The results showed that Benford's Law effectively reduced the dataset to a smaller pool of suspicious profiles, which the LRT then evaluated in more detail. Compared to the standalone use of LRT as described in the academic paper, Capgemini's combined approach demonstrated practical feasibility in the GB context. Their work confirmed that integrating statistical tests with machine learning models improves precision and reduces false positives, supporting more targeted and cost-effective theft investigations.

"Can Gas Consumption Data Improve the Performance of Electricity Theft Detection?" Wenlong Liai, et al. IEEE Transactions on Industrial Informatics, Vol 20, No 6, June 2024

Using gas consumption data alongside electricity usage can significantly improve the detection of electricity theft. The study found that suspicious discrepancies—such as unusually low electricity consumption paired with high gas usage during winter—can serve as reliable indicators of tampering or bypass activity. By training machine learning models on both fuel types, researchers were able to identify anomalies with much greater accuracy than with electricity data alone.

This insight would seem to demonstrate that the coordinated use of dual-fuel data can help suppliers and ultimately the Energy Theft Unit (ETU) to better target investigations, reduce false positives, and improve operational efficiency. It also aligns with the REC's mission to promote innovation and effective market operation.

RECCo could explore enabling structured data-sharing mechanisms—potentially through the Consumer Consent Framework or Referral Assessment Service—to make use of dual-fuel analytics. This approach would

support more accurate theft detection and allow for better prioritisation of cases, contributing to long-term efficiency and consumer protection. A pilot initiative or REC modification could help realise these benefits and ensure alignment with data protection requirements and supplier capabilities.

"*An Energy-Fraud Detection-System Capable of Distinguishing Frauds from Other Energy Flow Anomalies in an Urban Environment*" Netzah Calamaro, et al. Sustainability, 2021.

This research, developed by Tel Aviv University, proposes a novel fraud detection algorithm tailored to urban electricity grids. It aims to enhance theft detection by accurately distinguishing fraudulent behaviour from legitimate but irregular consumption anomalies—such as maintenance-related deviations or meter faults—using smart metering data. The system integrates multiple layers of machine learning techniques including autoencoders, CNN-GRU neural networks, high-dimensional clustering, and principal component analysis (PCA). These tools allow the system to generate "data collaborative signatures" for consumption patterns, enabling reliable classification of fraudulent versus non-fraudulent behaviour. Field-tested using real data from distributed system operators (DSOs), the model showed strong potential to reduce false positives while capturing previously undetected theft activity.

The system's modular design and focus on false-positive reduction make it highly relevant to the REC mission of promoting innovation and efficiency in retail market operations. Incorporating similar AI-driven fraud detection techniques could enhance the performance of the ETU and the RAS. It also presents a case for data-sharing frameworks—such as the Consumer Consent Framework—to support advanced analytics. By improving detection accuracy and reducing wasted investigation effort, it aligns with the REC objectives of efficient system operation and consumer protection.

"Minimizing Electricity Theft Using Smart Meters in Advanced Metering Infrastructure (AMI)" M. Anas, et al. Seventh International Conference on P2P, Parallel, Grid, Cloud and Internet Computing, 2012.

This paper explores how smart meters, embedded within Advanced Metering Infrastructure (AMI), can reduce electricity theft—a major contributor to non-technical losses (NTLs). It identifies common theft methods involving electromechanical meters (e.g. magnet interference, grounding neutral wires) and contrasts these with the capabilities of smart meters, which offer improved security, automated alerts (e.g. Earth Leakage indicators), and secure data transmission via protocols like ZigBee and Power Line Communication.

The study also outlines advanced detection techniques, including Support Vector Machines (SVM), Artificial Neural Networks (ANN-MLP), and Optimum Path Forest (OPF) classifiers. The OPF method proved most accurate, outperforming others in identifying fraudulent patterns.

The findings in the paper suggest a clear opportunity for RECCo to deepen collaboration with DNOs as part of its theft reduction strategy. DNOs are both data-rich and infrastructure-critical stakeholders whose involvement could enhance the reach and precision of theft detection capabilities and related services. By formalising cooperation pathways—whether through REC change proposals, data sharing frameworks, or joint innovation projects—RECCo could significantly increase the effectiveness of cross-sector theft prevention, and the impact such theft has on Non-Technical Losses.

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