WELCOME

SSEN Future Networks DIME and I-LAD Webinar

Wednesday, 10 June 2026

Scottish & Southern Electricity Networks

HOUSEKEEPING

- Please ask questions throughout the session using the Q&A function
- Today’s session will be recorded and will be made available after the event, along with the slides. Q&A sessions will not be published.

Video/webcams off
Please only turn your video on for the discussion in break-out rooms

Mics on mute
Please stay on mute unless you are asking a question

Technical queries
If you have any technical questions let us know

WELCOME AND INTRODUCTION

Simon O'Loughlin, Innovation Project Manager

Scottish & Southern Electricity Networks

SSEN DISTRIBUTION

WHO WE ARE

We're Scottish and Southern Electricity Networks (SSEN) Distribution. We're the Distribution Network Operator (DNO) responsible for delivering power to almost 4 million homes and businesses across central southern England and the north of Scotland.

We serve some of the UK's most remote communities - and some of the most densely populated. Our two networks cover the greatest land mass of any UK DNO, covering 72 local authority areas and 75,000km² of extremely diverse terrain.

We're also at the forefront of delivering the decarbonised electricity system of the future, connecting new low-carbon technologies to the network. Through this, we're helping support sustainable economic growth for decades to come.

SSEN DISTRIBUTION NETWORK AT A GLANCE

North of Scotland
SSEH/SHEPD LICENCE AREA

Nearly **4 million** homes and businesses

Over **128,000km** of overhead lines and underground cables

Over **460km** of subsea cables powering our island communities

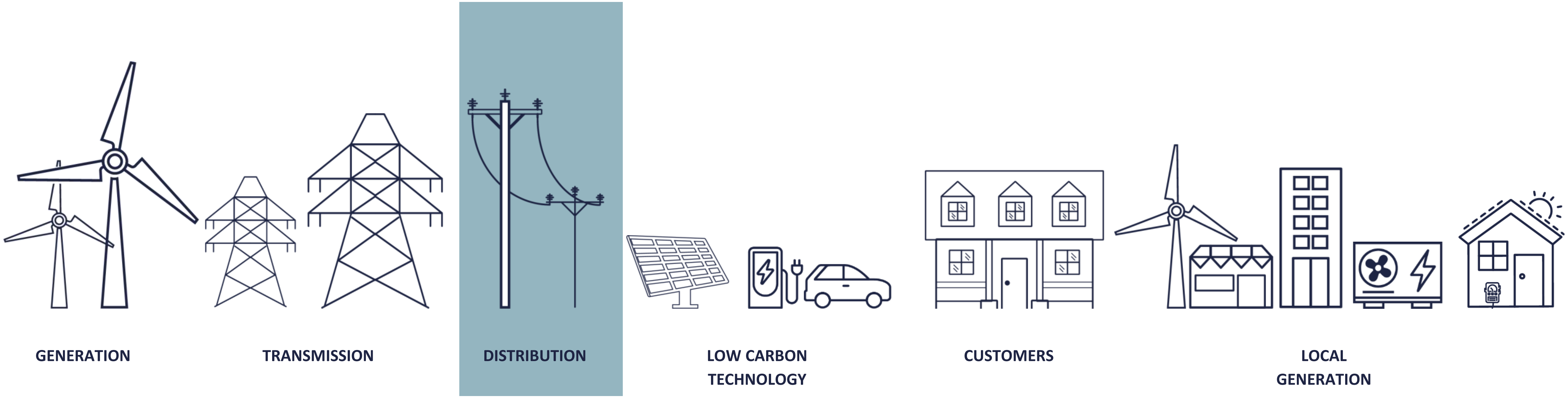
Over **4,400** employees across the country

Central Southern England
SSES/SEPD LICENCE AREA

OUR ROLE IN THE ENERGY SYSTEM

As a Distribution Network Operator, our role in the energy system is to carry electricity from the high voltage transmission grid to industrial, commercial and domestic users via a network of cables and poles.

We provide this service for every home and business in the north of Scotland and central southern England regardless of who you pay your energy bills to.



We are regulated by Ofgem, the energy regulator, through a 5-year price control cycle. Our latest business plan, for RIIO-ED2, runs until March 2028, and we are currently developing our business plan for the 5-year ED3 period which runs from April 2028 until March 2033.

DIME – DEMAND INSIGHTS FOR METERED ENTERPRISES

Brandon Jones, Innovation Project Manager

Scottish & Southern Electricity Networks

AGENDA

- Executive Summary
  - Problem Context
  - Solution and Impact
- Phase Highlights
  - Data Availability and Analytics Approach
  - Value Case
- Conclusion and Next Steps

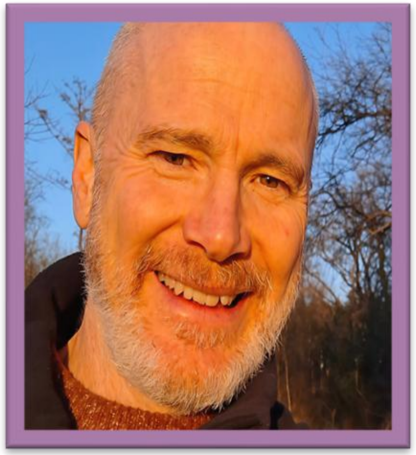
PROJECT TEAM

Brandon Jones
Innovation Project Manager

Freya McCormick
Senior Principal

Emma Kearney
Consultant

Fiona Fulton
Industry Advisor



Jason Taylor
Energy Manager

Scottish & Southern Electricity Networks

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SOUTHAMPTON CITY COUNCIL

EXECUTIVE SUMMARY

Problem Context

- UK has 5.5 million SMEs (99.8% of private sector businesses)
- SMEs are critical to achieving net zero and decarbonisation goals
- Major data gap for SMEs with non-half-hourly (NHH) metering
- Particularly affects high streets and mixed-use urban areas

Why This Matters

- DSOs lack visibility of who is using energy and how
- Demand profiles are generic and inaccurate
- Leads to:
  - Inefficient network investment
  - Under/over-provisioned infrastructure
  - Reduced local energy resilience
  - Missed reinforcement deferral and cost-saving opportunities
- Slows low-carbon technology (LCT) uptake

EXECUTIVE SUMMARY

Problem Solution

- Develop methods to infer SME energy demand without HH data
- Use alternative data sources:
  - Business rates data, connectivity capacity data etc.
  - Machine learning techniques
  - Collaborative data-sharing frameworks
- Generate more accurate demand profiles for non-domestic non-half-hourly customers

Overall Impact

- To the extent that DIME improves accuracy of LV modelling, it will support better DNO decision making – particularly LV network reinforcement decisions
- Estimated positive net present value (NPV) of £272k from implementing DIME within SSEN
- May be additional benefits if DIME profiles are made available to third parties such as local authorities or businesses, or used in future demand forecasting

PHASE HIGHLIGHTS

Scottish & Southern
Electricity Networks

DATA AVAILABILITY AND ANALYTICS APPROACH

Business Identification Information	Investigating how business rates information can improve identification of non-domestic NHH customer types.
Data Sharing and Integration	Assessing the availability, access and integration of datasets to enable robust analytics for NHH load estimation.
Analytics Overview	Establishing the DIME analytics framework.
Approaches and i-LAD Alignment	Developing and evaluating ML approaches for load estimation while aligning with i-LAD methodologies.

BUSINESS IDENTIFICATION INFORMATION

Business Classification

- SIC codes provided limited value for identifying NHH businesses
- EPC is useful, but datasets incomplete
- Authorised capacity, recorded at connection, is useful additional data but cannot classify a business alone
- Machine Vision e.g. StreetView, is feasible but likely overkill

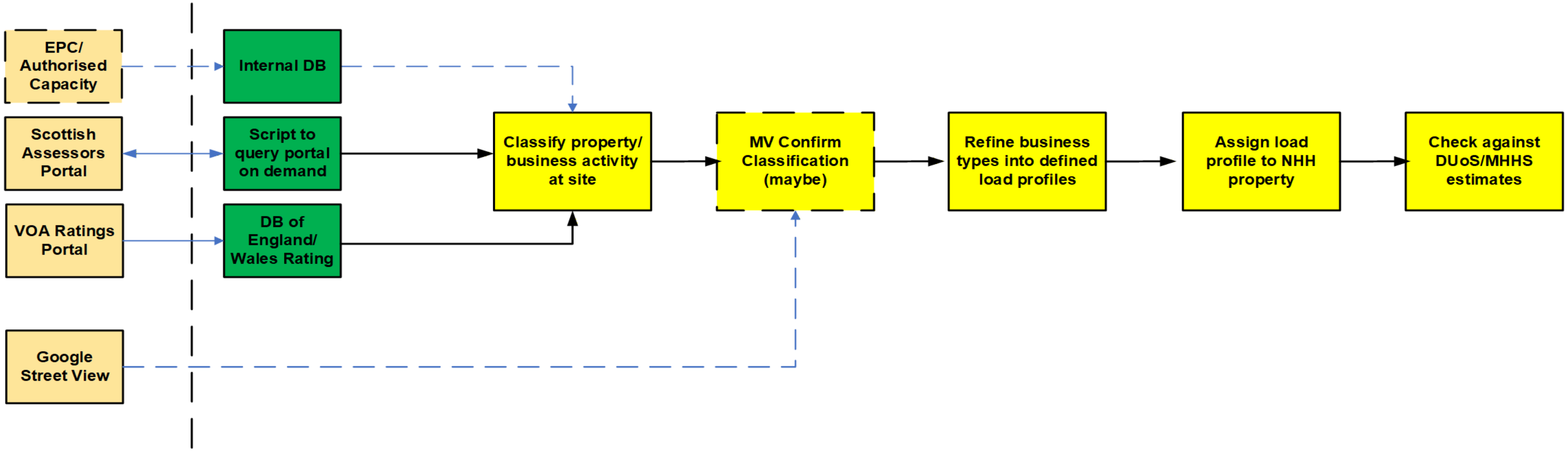
Business	Address	Rates Info			
		Description	**Proprietor**	**Rateable Value**	**Floor Area**
A Company Ltd	*(1F) 2 LOCHSIDE VIEW EDINBURGH EH12 9DH*	Office	EDINBURGH MILLER HOUSE PROPERTY	xxxx	xxxx
		EPC Info			
		No entry			
	Registered Address same, multiple listings	**Companies House**			
		SIC			
		41201 - Construction of commercial buildings			

Business	Address	Rates Info					
		Description	**Special Category Code**	**Rateable Value**	**Floor Area**		
A Company Ltd	*Lapwing House, Peel Avenue Wakefield WF2 7UA*	Offices and premises	203G	xxxx	xxxx		
		EPC Info					
		Property Type	**Rating Band**	**Rating Value**	**Main Heating**	**Floor Area**	**UPRN**
		B1 Offices and Workshop businesses	D	97	Elec	1068	
	Registered address different	**Companies House**					
		SIC					
		41201 - Construction of commercial buildings					

business rates information as the most complete and reliable source for identifying non-domestic NHH businesses.

DATA SHARING AND INTEGRATION

Data Integration



Data Sharing

We **did not identify any personal data sharing requirements** or any significant barriers to data use.

- Although meter consumption/DUoS/settlement information could be considered commercially sensitive this data is already available to the DNO and there will be not be a requirement to share this information outside of the DNO in its raw form.

Data Requirements

All the network data sets are **confirmed available** for use by DIME, with a significant crossover with data sets used by the I-LAD project

ANALYTICS

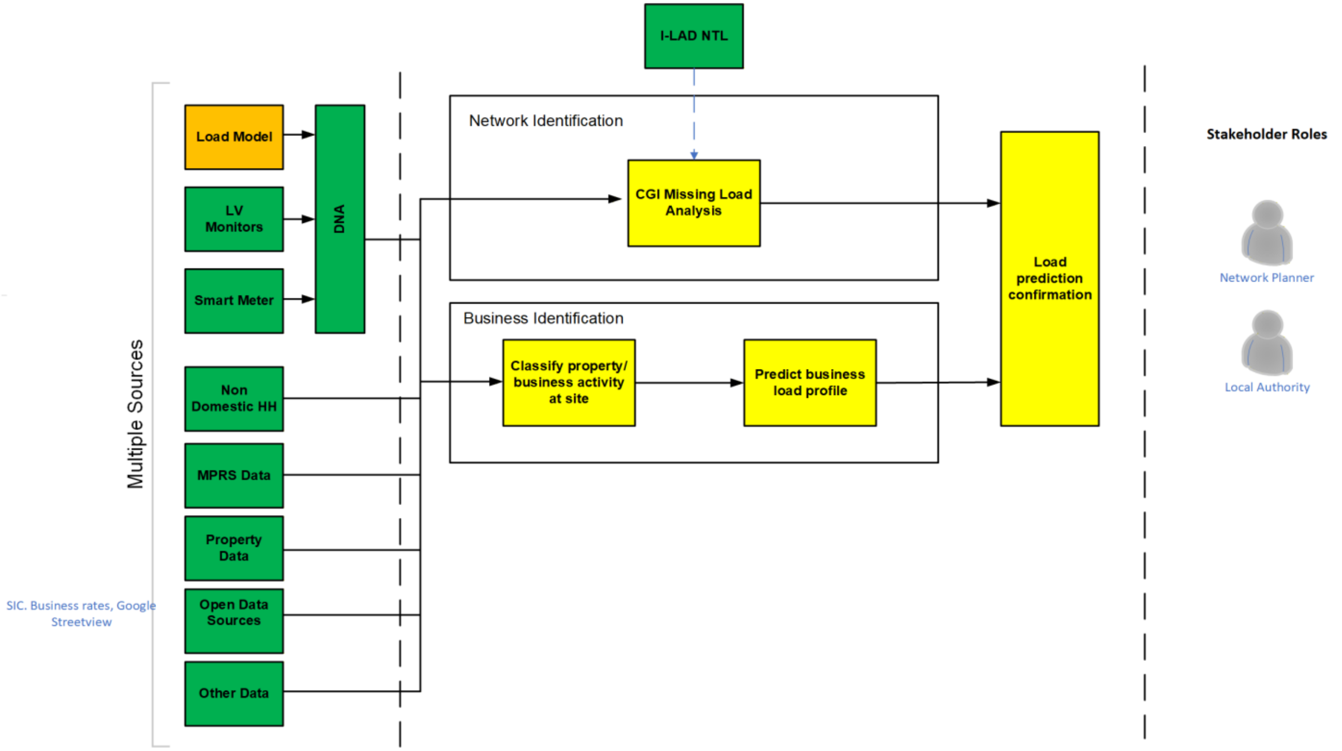
A two-stream approach was identified:

1. Classify businesses (WP2) and assign representative load profiles. Alignment with MHHS may be possible, although DIME offers more granular load assignment for LV modelling.

2. Re-use I-LAD techniques to assess missing load from NHH site estimation using network measurements.

A final stage would compare estimated loads against network measurements to improve accuracy.

There is a close alignment between the I-LAD methodology for identifying Non-Technical Losses (NTL) and DIME objectives .



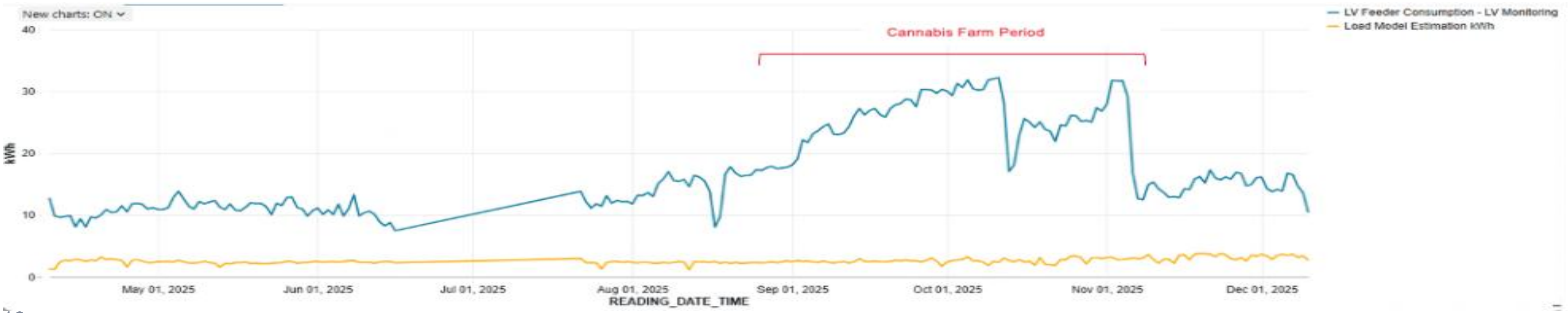
APPROACHES AND I-LAD ALIGNMENT

Three approaches can be adopted to estimate load profiles for non-half-hourly (NHH) non-domestic customers.

- **Category-Based Averaging:** Assigns average HH load profiles based on business type and characteristics.
- **Clustering-Based Profiles:** Groups customers with similar consumption behaviours to derive typical load profiles.
- **Machine Learning Estimation:** Uses business attributes and HH consumption data to predict NHH load profiles.

Alignment with i-LAD

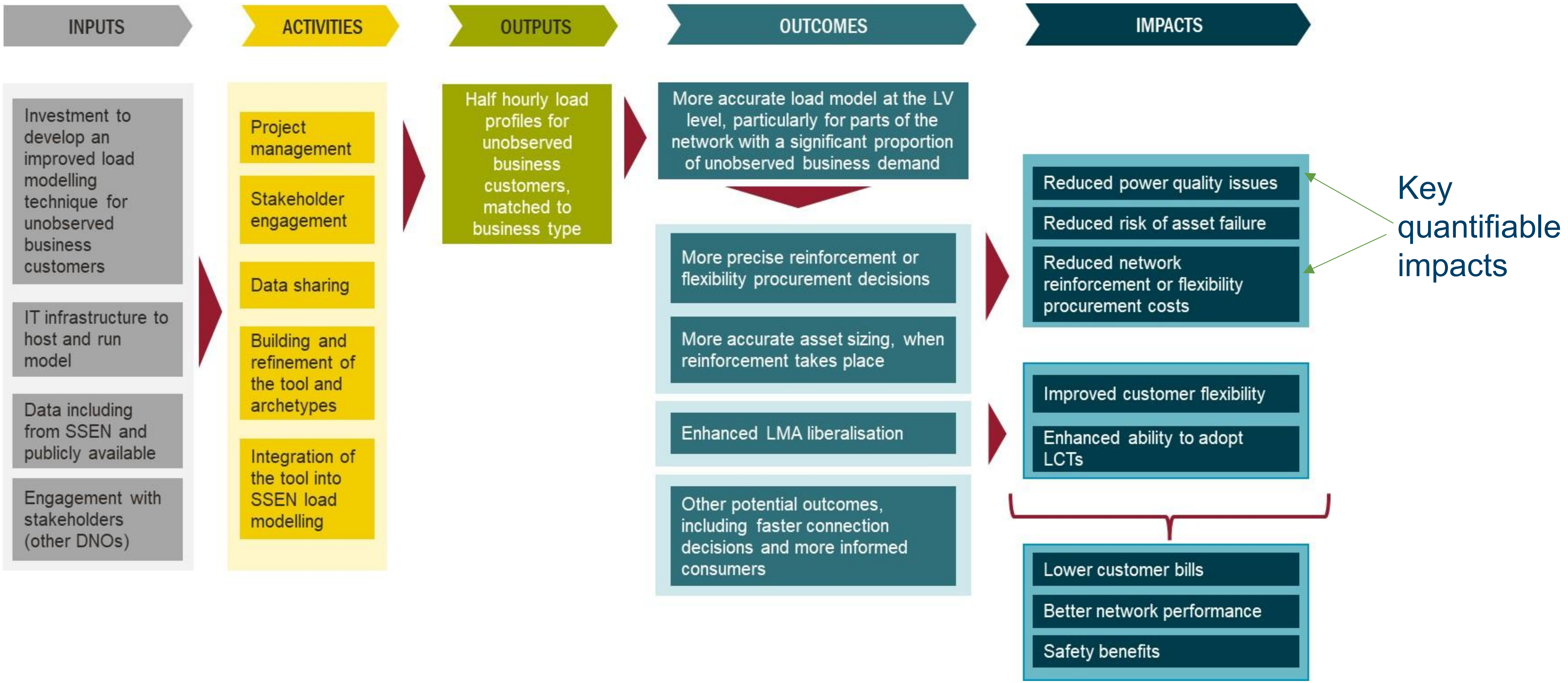
As an example of alignment with the I-LAD project, the graph below shows an LV feeder consistently underestimated by the LV load model. The improved estimation of large NHH loads with DIME could make the load estimate much more accurate (yellow line closer to blue outside cannabis farm activity period) and make Non-Technical Loss variations easier to identify.



EVALUATING THE DIME VALUE CASE

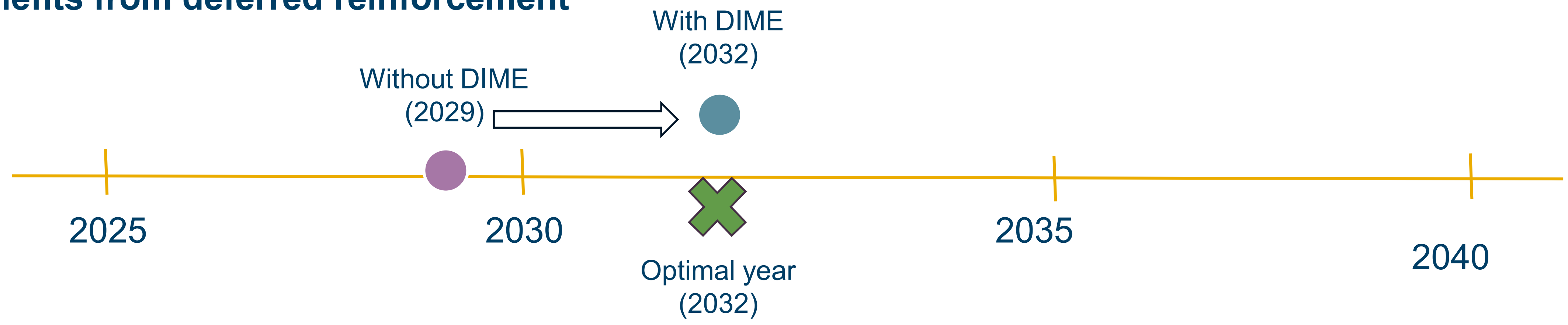
Process mapping	Understanding where outputs of the load model are currently used within SSEN and how this may change over time.
Theory of change	Developing a theory of change, and logic model, which maps out how improvements in load modelling could produce benefits.
Quantifying the benefits	Quantitative modelling of how changes in model accuracy affect the benefits – considering how model accuracy affects decisions, current model accuracy and potential improvements as a result of DIME.
CBA	Integrating the benefits model above into the SIF CBA framework, to evaluate costs and benefits and estimate the net social present value of DIME.

IMPROVED MODEL ACCURACY WILL ALLOW SSEN TO MAKE BETTER REINFORCEMENT DECISIONS (AMONG OTHER BENEFITS)



WE MODELLED THE IMPACT ON ILLUSTRATIVE TRANSFORMERS AS A RESULT OF DIME

Benefits from deferred reinforcement



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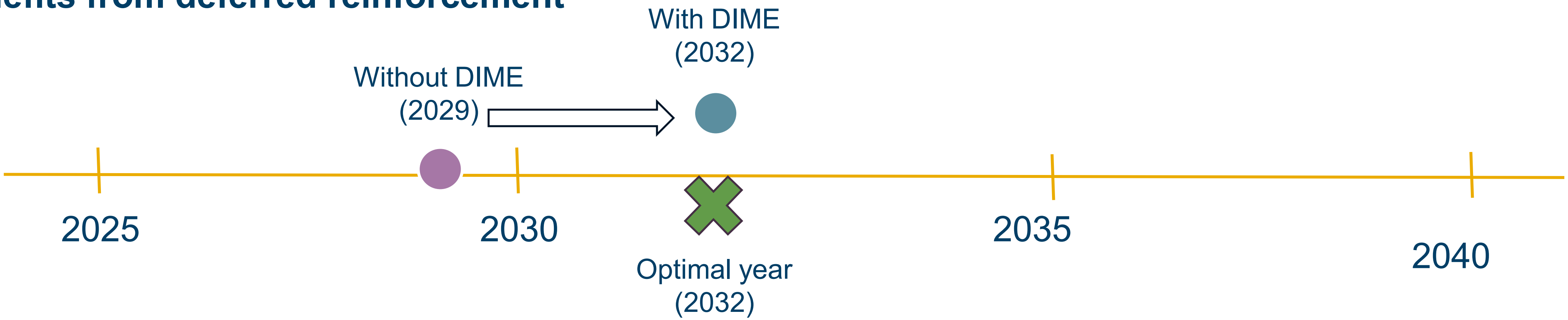
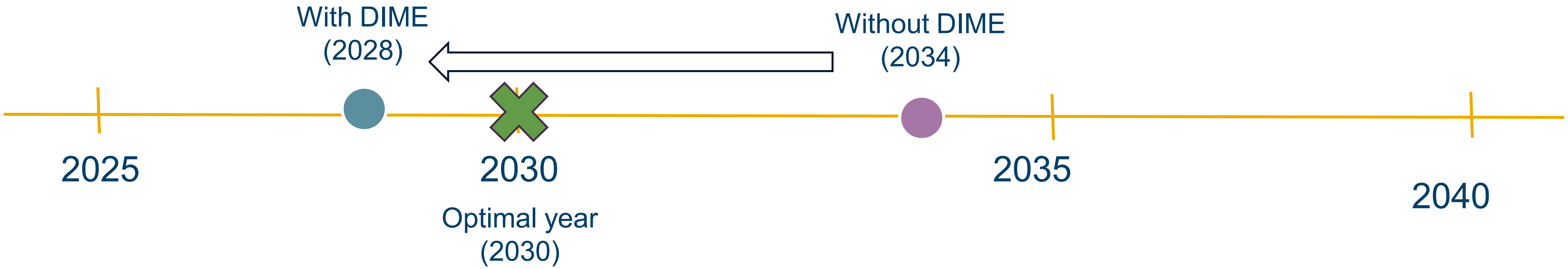
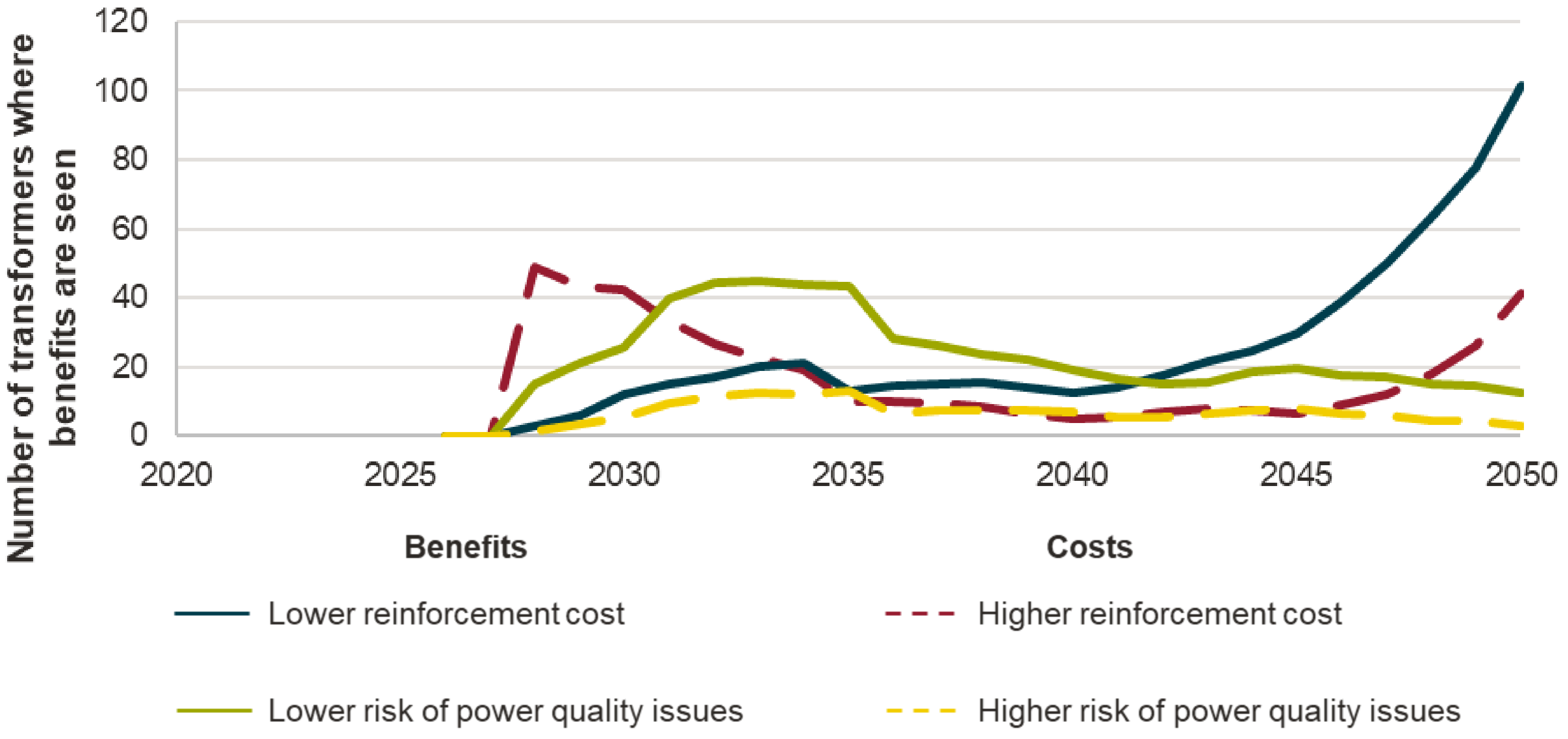


Benefits from reducing risk of power quality issues



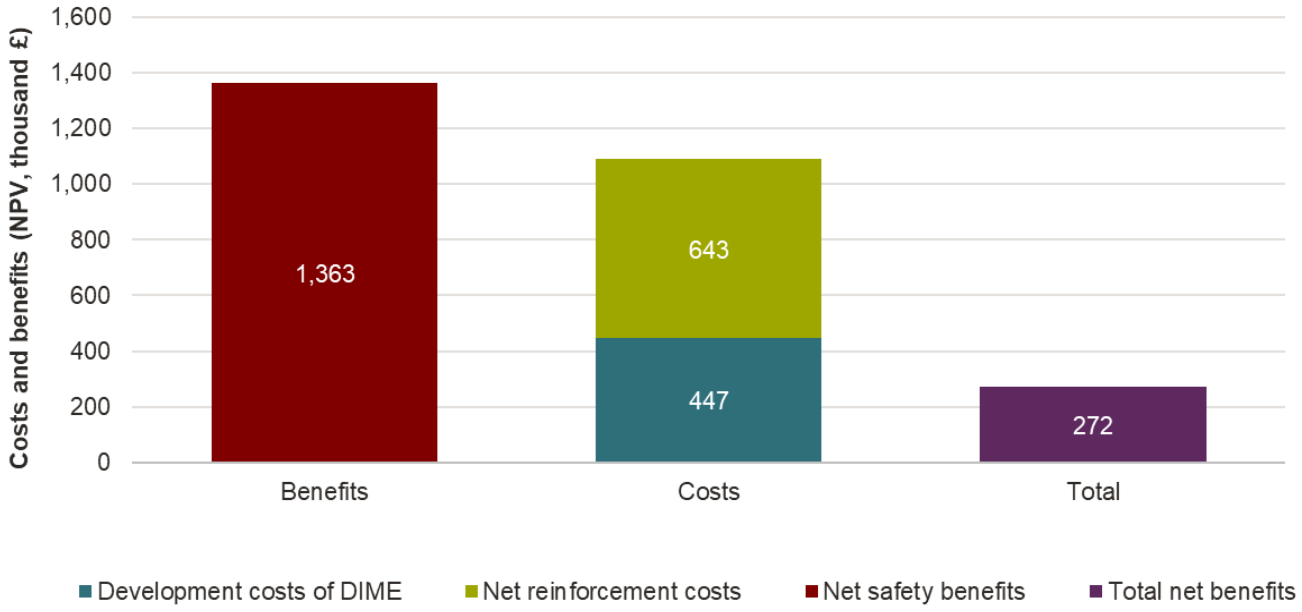
WE ESTIMATED THE NUMBER OF TRANSFORMERS WHERE REINFORCEMENT DECISIONS CHANGE AS A RESULT OF DIME



These benefits are then valued to calculate our CBA results...

DIME IS EXPECTED TO PRODUCE A POSITIVE SOCIAL VALUE – BUT THE RESULTS ARE UNCERTAIN

- Should DIME lead to the assumed improvement in LV modelling accuracy **within SSEN**, this would generate an estimated positive net present value (NPV) of **£272k**.
- If DIME was **rolled out more widely across DNOs**, the NPV of benefits would be **£1.5m**.
- There are some uncertainties in these results. There are also **unquantified benefits** which would push up the value case**.**



CONCLUSION AND NEXT STEPS

Scottish & Southern Electricity Networks

RESULTS AND KEY CONCLUSIONS

Our analysis has found that DIME:

- Represents a viable solution
- Generates an expected positive business case
- Complements I-LAD
- Has a business case dependent on other factors

DIME – NEXT STEPS

The project team have reviewed many options for the next phase of the DIME project, with option 2 below being the preferred option:

1

Continue to Alpha phase

2

Combine with i-LAD Beta

- Leverage **shared datasets** and analytical approaches
- Align with **common LV load modelling framework**
- Position DIME as a **preparatory stage** for i-LAD

3

Do not progress further

Scottish & Southern Electricity Networks

working with

CGI

frontier economics

SOUTHAMPTON CITY COUNCIL

Thank You

I-LAD-SIF R4 ALPHA SHOW AND TELL

I-LAD

Innovating Losses Analysis and Detection

Scottish & Southern Electricity Networks

AGENDA

- Team Introduction
- Problem Context
- I-LAD Alpha
- Project Highlights
- UI Demonstration
- Project Deliverables
- Next Steps

Project Team

I-LAD
Innovating Losses Analysis and Detection

PROJECT TEAM

Divante Malcolm
Innovation Project manager

Scottish & Southern Electricity Networks

Simon O'Loughlin
Innovation Project manager

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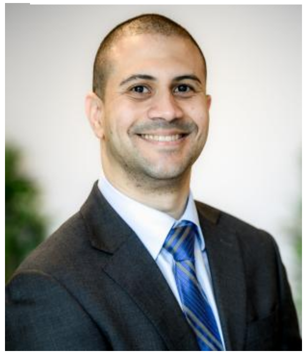
Harry Davies
Senior Consultant

frontier economics

Fiona Fulton
Industry Advisor

CGI



Martin Tejada
Innovation Project Manager

SP Electricity North West

David Lewis
Revenue Protection Team

ScottishPower

Problem Context

I-LAD
Innovating Losses Analysis and Detection

Divante Malcolm (SSEN-Distribution)
Innovation Project Manager

David Lewis (ScottishPower)
Data Analytics Manager, Revenue Protection

Martin Tejada (SP ENW)
Innovation Project Manager

WHAT ARE ELECTRICITY LOSSES?

	Who?	How?	
Technical Losses Electricity lost during operating network equipment	DNO's responsibility	Equipment upgrades	Well-developed methodologies
Non-Technical Losses • Management of Unmetered Suppliers • Metering issues • Theft	Shared DNO-Supplier responsibility + Many other stakeholders	- Manual processes - Reliant on tip-offs - Lack of secure data sharing - Sophisticated theft methods	- Reactive - Uncoordinated - Frequent false positives

WHY LOSSES MATTER

Financial impact

- More losses = more electricity must be generated
- This ultimately **increases customer bills**

Environmental impact

- Lost electricity still requires generation
- Losses account for **~90% of a DNO's greenhouse gas emissions**

Regulatory obligation

- SSEN must ensure losses are **"as low as reasonably practicable"** under its licence

HOW BIG IS THE PROBLEM?

2,057 GWh total losses

Equivalent to **425,895 tCO_2e**

~93% of SSEN's total reported GHG emissions

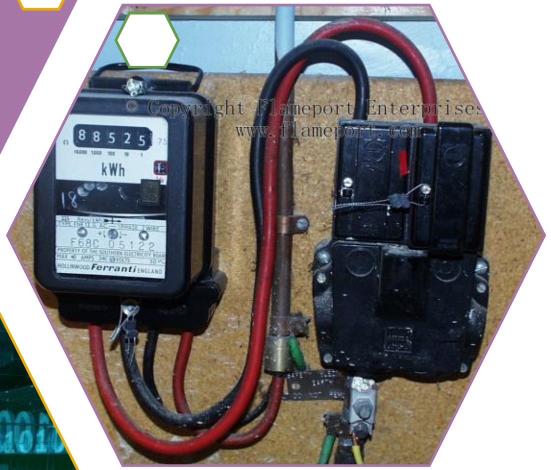
NON-TECHNICAL LOSSES

Inaccuracies in unmetered supplies

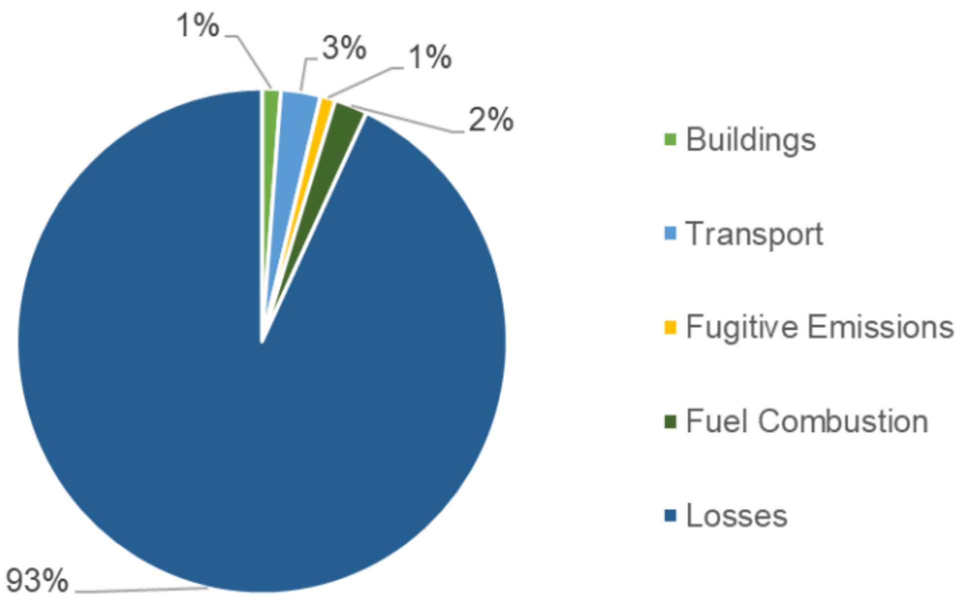
Metering errors and settlement inaccuracies

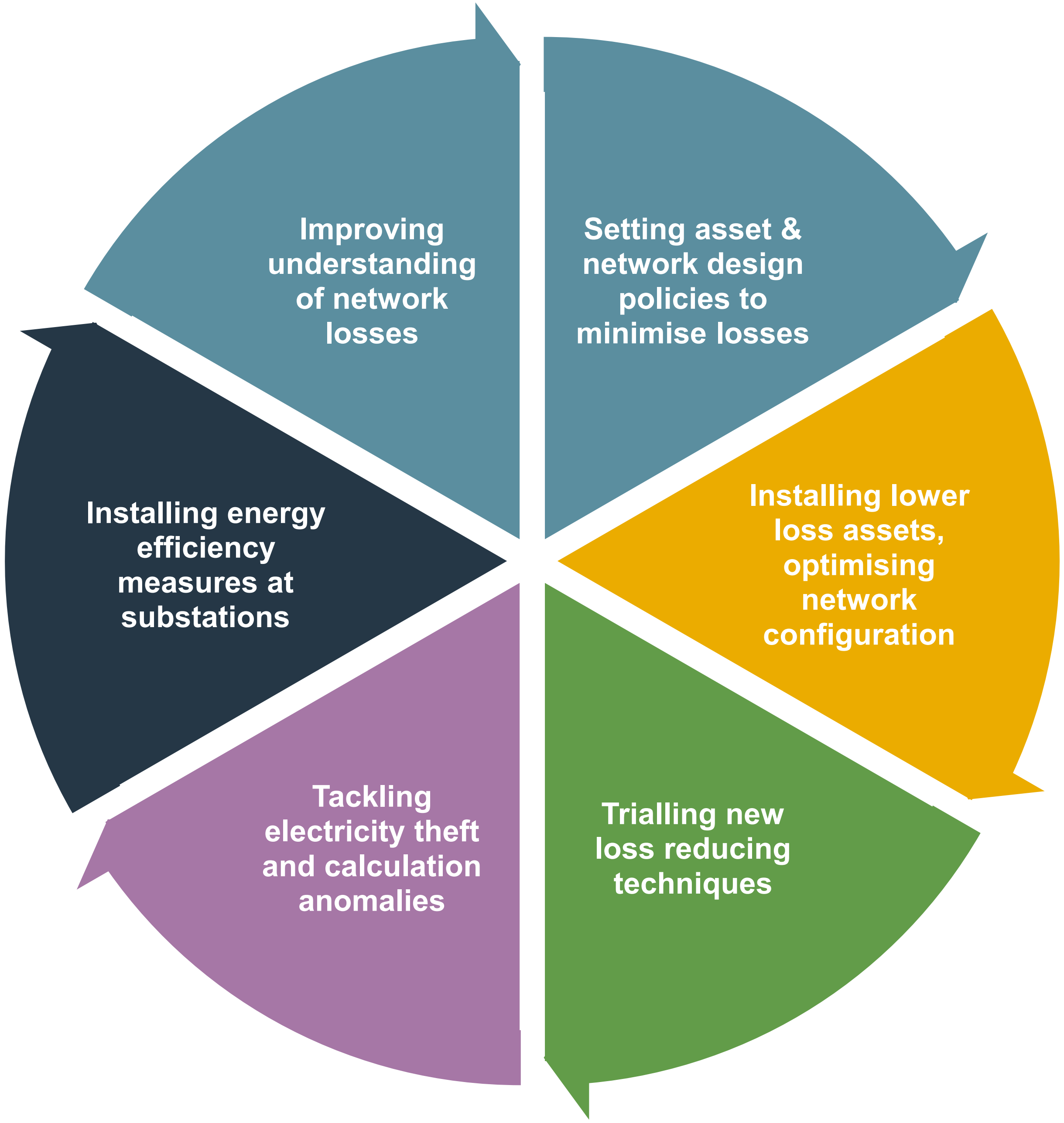
Missing or unregistered supply points

And electricity theft or tampering



SSEN'S LOSSES STRATEGY





SP ENW – TOTAL LOSSES (PERIOD UP TO 2021)

Voltage level	Typical losses as percentage of total energy
132kV*	0.7%
33kV+	1.0%
HV+	1.2%
LV+	3.1%

Note:
*excludes losses from supergrid transformers and transmission network
+ include losses from the indicated voltage level and immediate upstream transformation level (e.g. figure shown for 33kV comprises losses at 33kV and 132/33kV transformers)

Two arrested after police raid cannabis farms in Greater Manchester town

Hundreds of plants were found in the raids

NEWS By Ram

20:04, 24 Oct 2025

Substantial cannabis farm discovered in Manchester City Centre property

: 17:55 27/03/2026

Police seize two tonnes of cannabis in farm raid

GREATER MANCHESTER POLICE

The cannabis seized is said by police to have a street value of about £24m

Angela Ferguson
North West

10 January 2026

'Fantastic find' for cops as £1m town centre cannabis farm smashed

About 2,200 plants were seized

Comments 1

NEWS By Andrew Bardsley Court reporter

17:48, 12 Dec 2025

Impact of Losses (Scottish Power Retail)

Perspective on how losses affect Scottish Power Retail.

1. THE PROBLEM

The ripple effect of energy theft

1 death every 10 days
Meter tampering remains a serious public safety risk.

Up to £1.4bn / year
Estimated sector cost from theft and non-technical losses.

+£50 per household / year
Estimated impact passed on to domestic customers.

250,000 cases (est.)
Estimated cases of theft that go unreported annually.
Safety reports (tip-offs) rise 19% YoY.

Undecked theft drives up costs, puts lives at risk and undermines the energy transition.

2. ILAD INTERVENTION

Data-driven detection. Better visibility. Measurable impact.

1. **Partnership Approach**
Facilitates partnership approach Integrates DNO, Supplier and other data to improve the quality and quantity of energy theft leads

2. **Compare and detect discrepancies**
Identify unexplained differences between energy entering the network and energy billed at premises.

3. **Prioritise risk**
Uncover locations and accounts with unusual patterns, discrepancies and potential safety concerns.

4. **Highlight hidden anomalies**
Reveal anomalies and discrepancies that could remain hidden using traditional supplier methodologies, leaving any follow-up action at the supplier's discretion.

ILAD enhances supplier visibility by uncovering losses that may otherwise go undetected through traditional approaches.

3. EXPECTED OUTCOMES

Lower losses. Safer communities. Fairer bills.

Reduction in Non-Technical Losses (NTL)
Help identify unmetered consumption. Helps ensure network integrity and reduce the risk of asset damage and localised grid overload

Improved Meter Safety at Premises
Reduction in Fire and Electrocution risk arising from Bypassing or Tampering with a meter and its cables.

Fairer Prices
Reduces the cost burden on legitimate customers so everyone pays their fair share.

Cleaner Energy Transition
Savings will enable suppliers to shift focus and invest in sustainable grid upgrades

Data-led detection today.
Safer communities and lower bills tomorrow.

I-LAD Solution

I-LAD
Innovating Losses Analysis and Detection

THE I-LAD SOLUTION

I-LAD combines network data, wider contextual datasets and advanced analytical techniques to help identify, prioritise and investigate non-technical losses more effectively.

01

User Interface Development

Stakeholder engagement with operational users to design how outputs are presented in an I-LAD dashboard.

02

Data Analytics Approach

Combines network data, public datasets and machine learning techniques to generate risk scores for potential non-technical losses.

03

Data Ethics & Governance

Defines how sensitive data should be used lawfully, proportionately and transparently, with human oversight of model outputs.

04

Cost-Benefit Analysis

Assesses whether improved detection can unlock net benefits by reducing losses and better targeting investigation resources.

05

Commercialisation & Route to Market

Considers how I-LAD could scale from an SSEN prototype to a multi-organisation service for DNOs and suppliers.

The Alpha phase tested whether I-LAD can become a scalable, trusted and actionable tool for reducing non-technical losses.

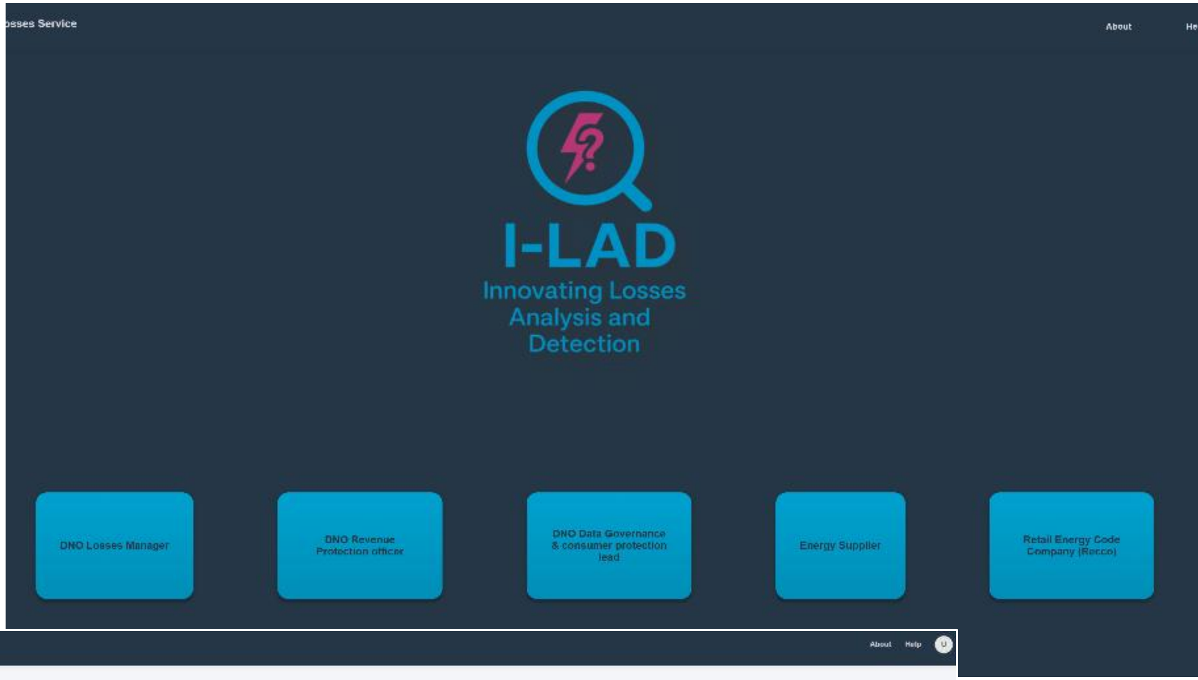
Alpha Highlights

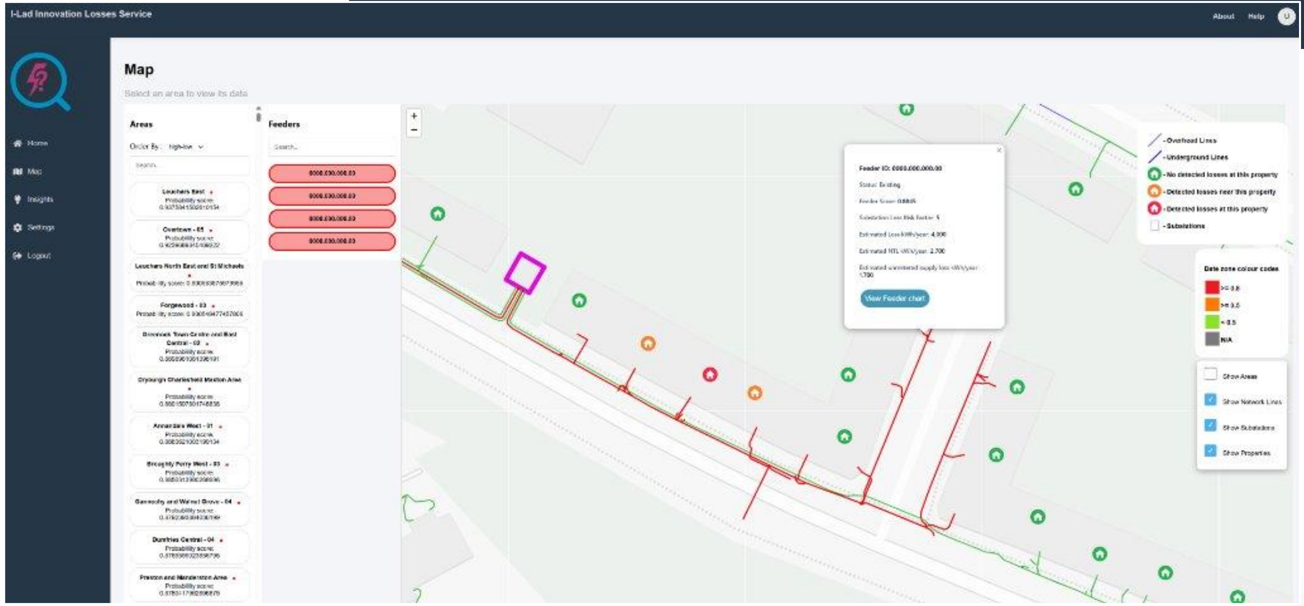
I-LAD
Innovating Losses Analysis and Detection

I-LAD - ALPHA UI PROTOTYPE

A requirements capture and stakeholders engagement tool

- Developed an Alpha prototype to bring the I-LAD service concept to life.
- Used with stakeholders to test the user journey and gather feedback.
- Helped refine requirements for different operational users.
- Demonstrated how model outputs and risk indicators could be presented in the UI.
- Explored role-based views so users only see the information relevant to them.





I-LAD
Innovating Losses Analysis and Detection


I-Lad Innovation Losses Service
About
Help
DNO losses Manager
U
I-LAD
Innovating Losses Analysis and Detection
DNO Losses Manager
DNO Revenue Protection officer
DNO Data Governance & consumer protection lead
Energy Supplier
Retail Energy Code Company (Recco)

I-LAD ANALYTICS

1 **Area analytics**
Wider risk context

2 **Feeder analytics**
Abnormal network behavior

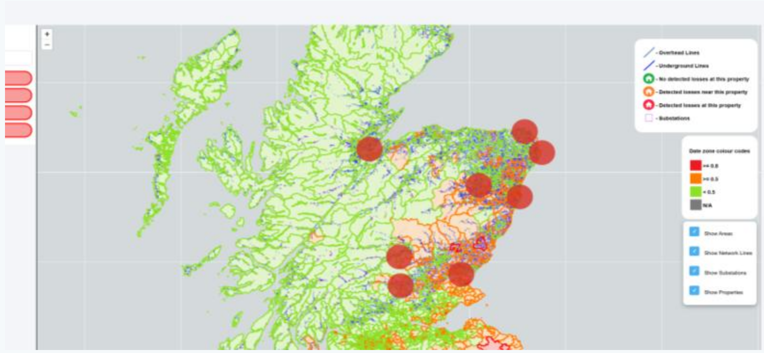
3 **Property analytics**
Voltage disturbance

4 **Overall I-LAD score**
Prioritised risk view

Area-Level Analytics

- Creates Data Zone risk scores using socio-demographic and open data
- Highlights areas with higher NTL risk
- Provides wider geographic insight alongside network analytics

Network-wide risk view



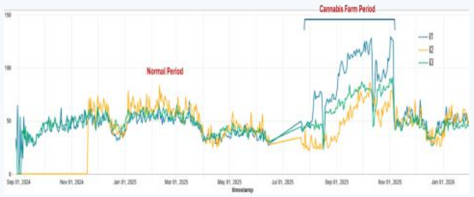
Output: Area risk score

Feeder-Level Analytics

Detects sustained abnormal consumption patterns

- Flags abnormal feeder behaviour from LV monitoring data
- Focuses on persistent patterns, not short spikes
- Compares actual demand with expected demand

Machine Learning Anomaly Detection



Power Difference

Output: Feeder risk score

I-LAD ANALYTICS

Combining multiple evidence layers to move from broad risk insight to prioritised investigation

1 Area analytics Wider risk context

2 Feeder analytics Abnormal network behavior

3 Property analytics Voltage disturbance

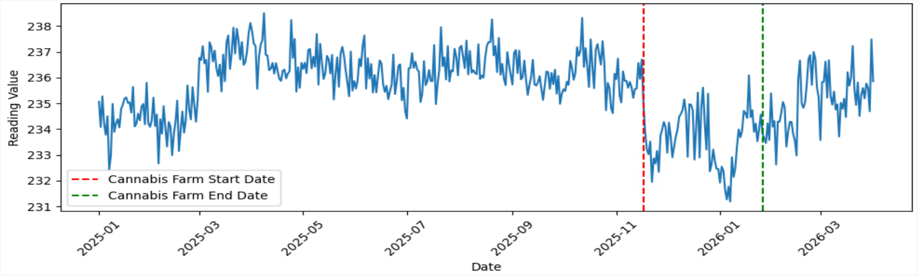
4 Overall I-LAD score Prioritised risk view

Property-Level Analysis

Uses SM voltage data to find properties within a flagged feeder

- Observed clear voltage drops during known cannabis farm activity
- Multiple properties on the same phase showed similar drops
- Beta will refine how voltage drop patterns are used to identify the likely source property.

Voltage drop during known activity



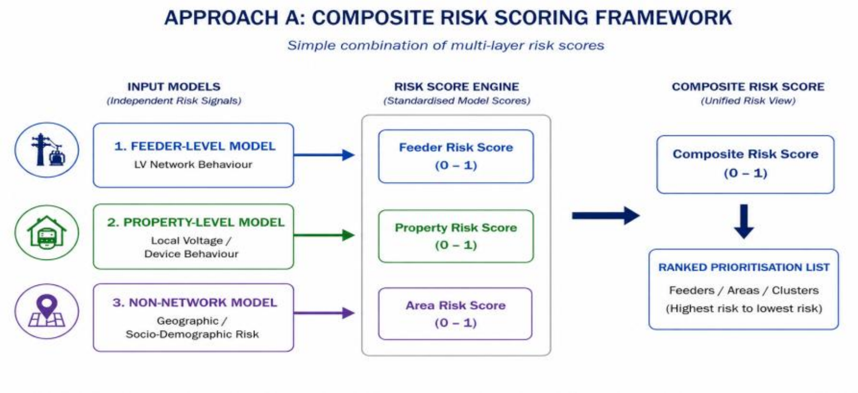
Output: candidate properties for further validation

Overall I-LAD score

Combining multiple signals into one prioritised risk view.

- Helps users focus on the highest-confidence cases first.
- Helps reduce false positives by requiring stronger evidence across multiple analytical layers.
- Provides a clearer and more explainable output for operational decision-making.

Composite risk scoring output



DATA ETHICS AND GOVERNANCE FOR A FUTURE I-LAD SERVICE

Key questions components of I-LAD data ethics and governance

Ensuring compliance with: UK GDPR, Data Protection Act 2018, Smart Energy Code, and Energy licence obligations.

What data can be shared, by whom, and under what conditions?

Which current regulatory and policy constraints may limit the highest-value I-LAD use cases?

How can we ensure data ethics principles are embedded in the data used for I-LAD predictive modelling

Key outputs

- **Our data governance and security assessment** suggests a multi-organisation I-LAD service is feasible
  - UK GDPR unlikely to be a fundamental blocker if designed with robust governance; clear lawful basis; data minimisation and human oversight.
  - Smart Energy Code is likely to be the main constraint on sharing of high-value, meter-level consumption data held by suppliers.
- **Our data ethics assessment** identified principles of transparency, fairness, explainability and proportionality to be applied when screening input data for use in the predictive model.

INVESTIGATION PROCESSES INVOLVING I-LAD

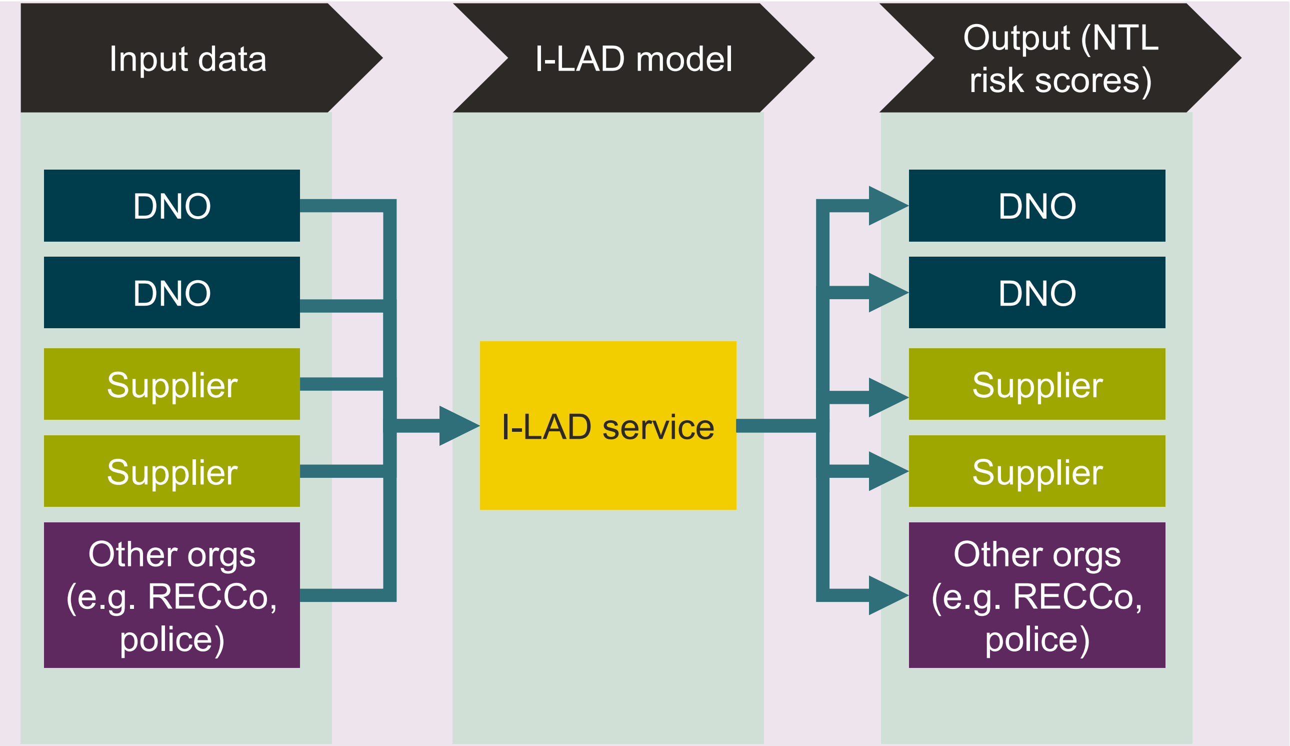
We have developed an outline NTL investigation process with I-LAD involving four core stages

Prioritisation of I-LAD leads vs. other detection methods	**Validation** of I-LAD leads selected for further investigation	**Escalation** of NTL cases to law enforcement (when necessary)	**Feedback** of investigation outcomes into I-LAD

Successful integration of the I-LAD tool into existing processes will ensure suppliers and DNOs can act on relevant leads, interpret outputs correctly, allocate resources efficiently, and manage regulatory and reputational risks.

TO SUPPORT A MULTI-ORGANISATIONAL I-LAD SERVICE, A SUSTAINABLE COMMERCIAL MODEL IS REQUIRED

Future ‘multi-organisation’ I-LAD service



Key commercial model design recommendations

How should multiple organisations access and use I-LAD?

- A 'centralised' service model – I-LAD operated by single entity who operates a secure portal with IT support, data integration, and training provided centrally to suppliers and DNOs.

Who should be responsible for operating the service?

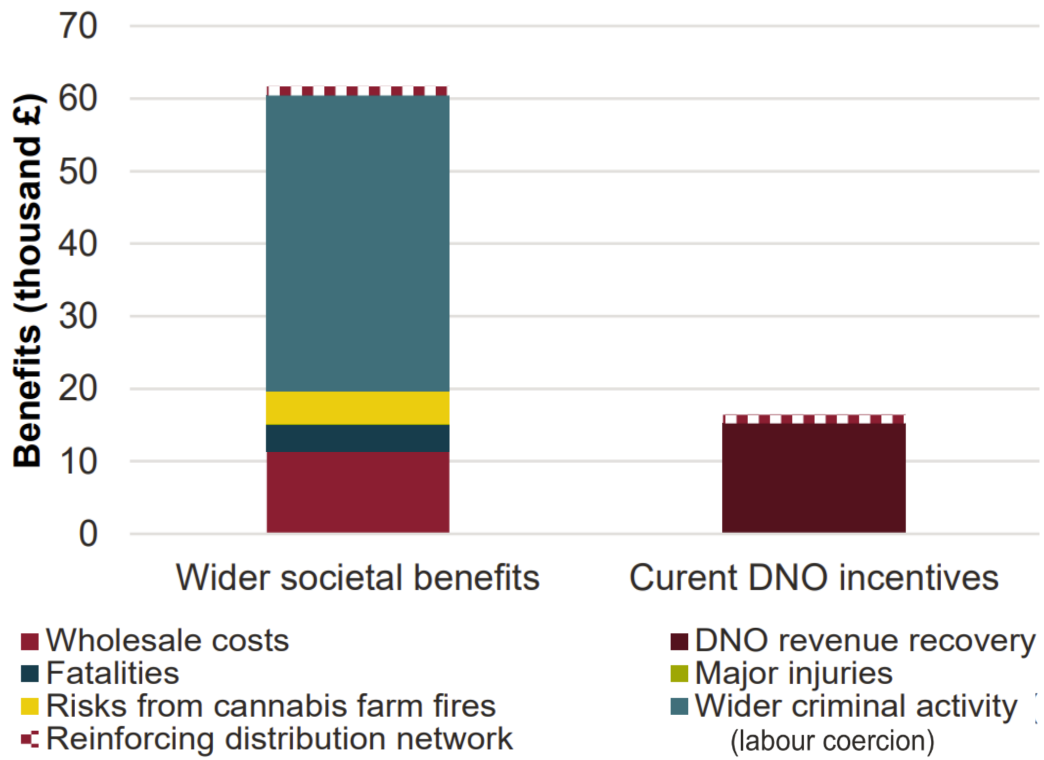
- An existing independent industry body with experience operating data analytics platforms in the energy sector. Candidate shortlisting would form part of a future Beta phase.

How should participation work?

- I-LAD adoption is voluntary for DNOs and suppliers.
- Prices may be set via a collective agreement model. ‘Heavy-duty’ price regulation may not be required given voluntary participation

I-LAD IS EXPECTED TO DELIVER MATERIAL NET SOCIETAL BENEFITS

Estimated benefits of identifying a single cannabis farm



CBA results

Estimated net benefits of UK-wide deployment

DNO benefit	Wider societal benefit
£8m	£150m

Key caveats – results focus on:

- Benefits from **cannabis farm detections only**, not other forms of non-technical loss.
- **Current levels of model performance.** Performance would be expected to improve with further development

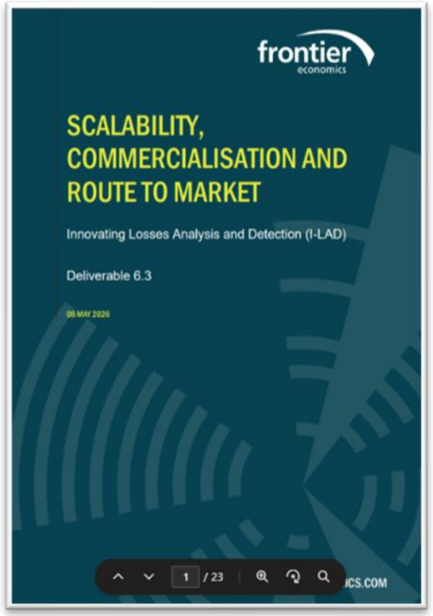
Alpha Deliverables

Documents available:

- by contacting: **FN.PMO@sse.com**
- Will be available via smarter Networks portal
- Link to discovery deliverables Here: 10143004 | ENA Innovation Portal

I-LAD
Innovating Losses Analysis and Detection

I-LAD ALPHA DELIVERABLES



Alpha CBA

●●●●

NEXT STEPS

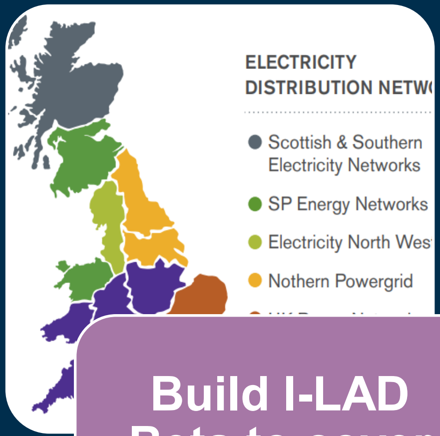
The I-LAD project team are excited to deliver I-LAD with existing partners, then GB-wide

To enable this, our plan is to:

Submit a Beta Application in the September SIF window

Incorporate learnings and ambitions from Project DIME Discovery into I-LAD Beta

Include more partners as applicable; NGED already look like joining



Build I-LAD Beta to cover England, Scotland, and Wales from inception

I-LAD

Innovating Losses Analysis and Detection

Scottish & Southern Electricity Networks

working with

CGI

SP Electricity North West

ScottishPower

frontier economics

With academic support from

Loughborough University

Q&A

HOW YOU CAN REACH US

- Engage during regular innovation project calls
- Participate in stakeholder webinars and events
- Submit an innovation proposal via the official idea form
- Email the Future Networks team directly

Alternatively, you can engage with us through our social media channels:

twitter.com/ssencommunity

facebook.com/ssencommunity

instagram.com/ssencommunity

linkedin.com/company/ssencommunity

THANK YOU FOR JOINING US TODAY

futurenetworks@sse.com

Scottish & Southern Electricity Networks