

TETRA TECH

ADB ASIAN DEVELOPMENT BANK

SMO / MEC

2026

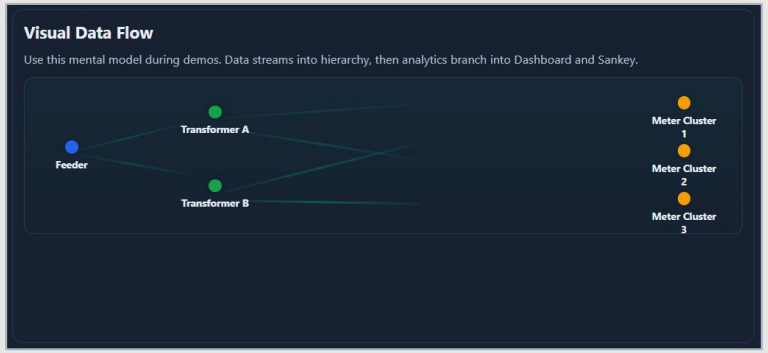
Energy Balance Data Analyzer Tool

DATA SOURCES

Four records describe the same feeder. Until they are brought together, none of them can show where energy is unaccounted for. The application holds all four against a single hierarchy and compares what was delivered with what was billed.

SOURCE	CONTENT	ROLE IN THE ANALYSIS
Mapping scheme	Feeder, transformer and meter hierarchy; customer identity, class of supply, VCB and coordinates.	Defines the structure. Provides the key on which the other three are joined.
Post-paid billing	Account-level consumption for customers invoiced in arrears, by reading date.	Contributes to billed energy.
Prepaid vending	Energy purchased in advance, recorded at individual transaction level.	Contributes to billed energy. Omitting it understates the billed side considerably.
AMI check meters	Energy delivered at each transformer to all customers connected below it.	Provides the supplied side of the comparison.

Billing and vending records are matched to the scheme on account number; check-meter readings are matched on the AMI meter identifier. Records that cannot be resolved to a feeder are held aside and reported, so that omissions in the scheme stay visible instead of quietly reducing the billed total.

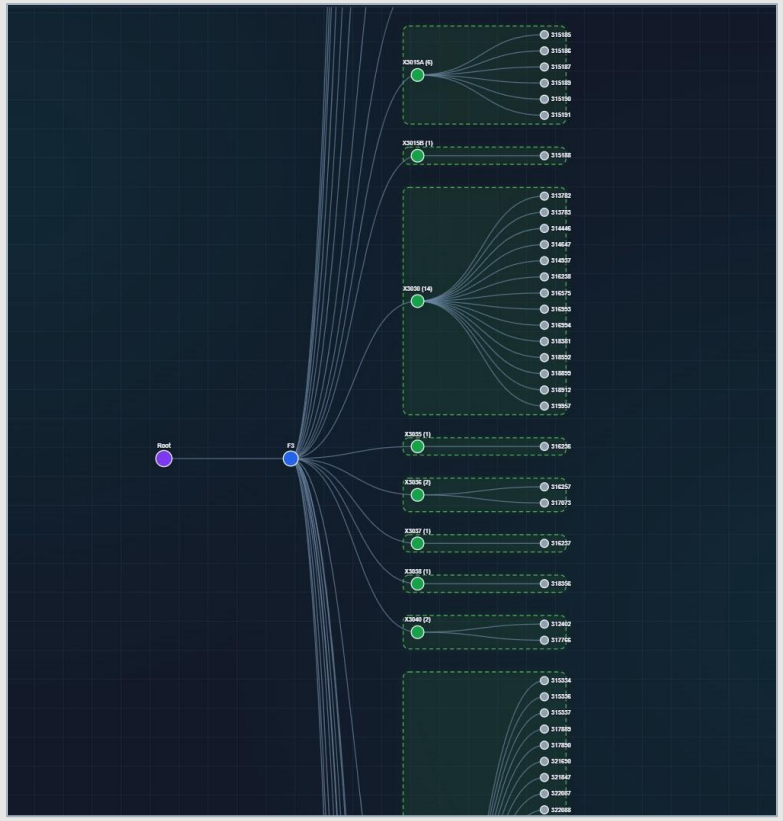


Reference diagram from the application manual.

Post-paid and prepaid consumption are added together as one billed quantity and set against the corresponding check-meter reading. The difference is attributed to a named transformer rather than to the feeder as a whole, which is what makes it something a team can be sent to investigate.

THE NETWORK AS RECORDED

The application draws the feeder from the mapping scheme: every transformer, and the customers connected beneath each one.



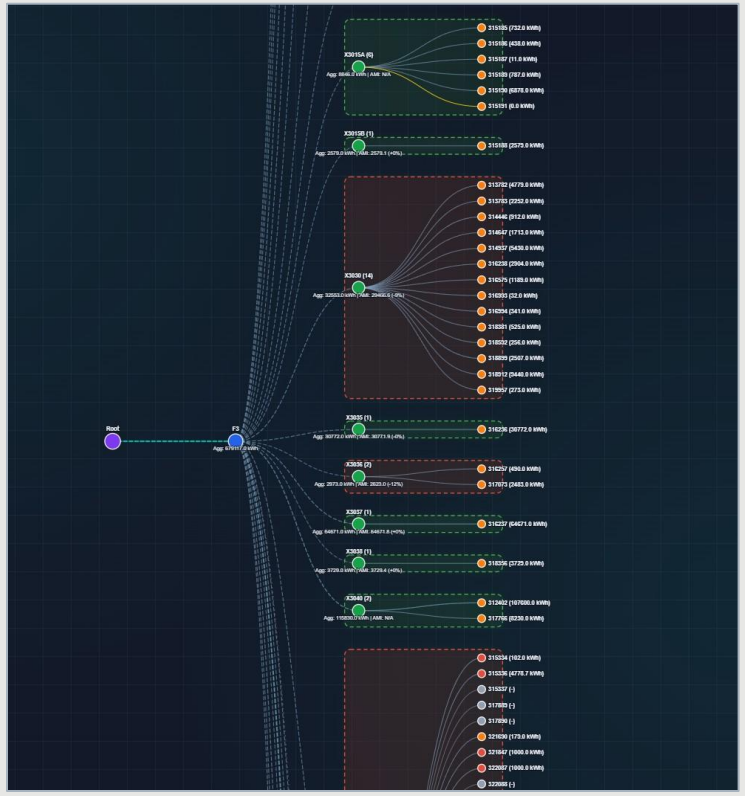
Each transformer is enclosed with its customers, so the group that would be inspected together also reads together. Accounts appear in the order the scheme holds them, identified by account number.

The scheme itself has always existed, but as a spreadsheet it was effectively unreadable. Drawn out, it can be reviewed by people who know the route — and a customer sitting under the wrong transformer becomes visible before it distorts any calculation.

Engineering, metering and revenue protection now work from one representation of the network instead of three separate extracts. In practice this removes a recurring source of disagreement about which customer belongs where, and it means a correction made in one function is visible to the others in the same period.

COMPARING SUPPLIED AND BILLED ENERGY

With the calculation engine running, each transformer shows the energy recorded at its check meter alongside the total billed to the customers beneath it. The enclosing group takes its colour from the result.



Within tolerance

The two figures agree to within the percentage the utility sets. No further action is indicated for the group.

Outside tolerance

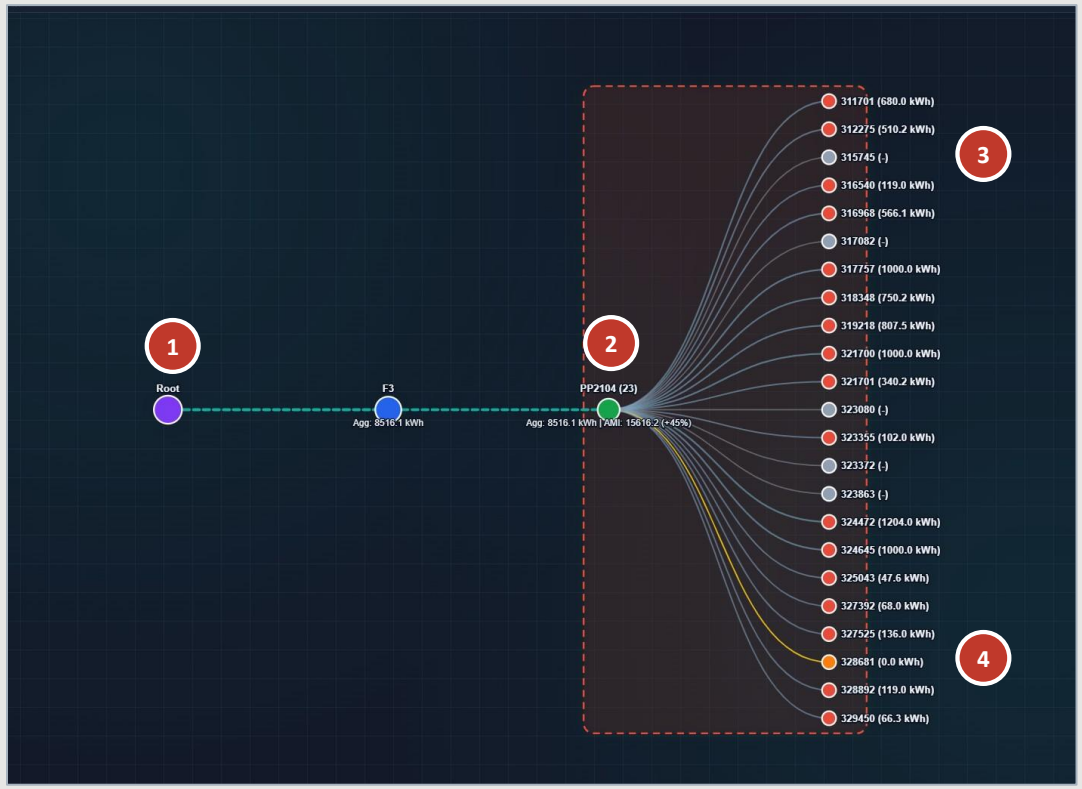
The difference exceeds the threshold. The group is identified for investigation, with its customers already listed.

Expressed as a single system percentage, loss tells an engineer nothing about where to stand. Expressed this way it arrives already located, and the tolerance is a setting the utility controls rather than a fixed assumption.

The colouring is deliberately coarse. It is meant to direct attention, not to quantify — the figures beneath each transformer do that, and the dashboard views that follow put them in order of priority.

WORKING AT TRANSFORMER LEVEL

The view can be reduced to a single transformer and the customers connected to it.

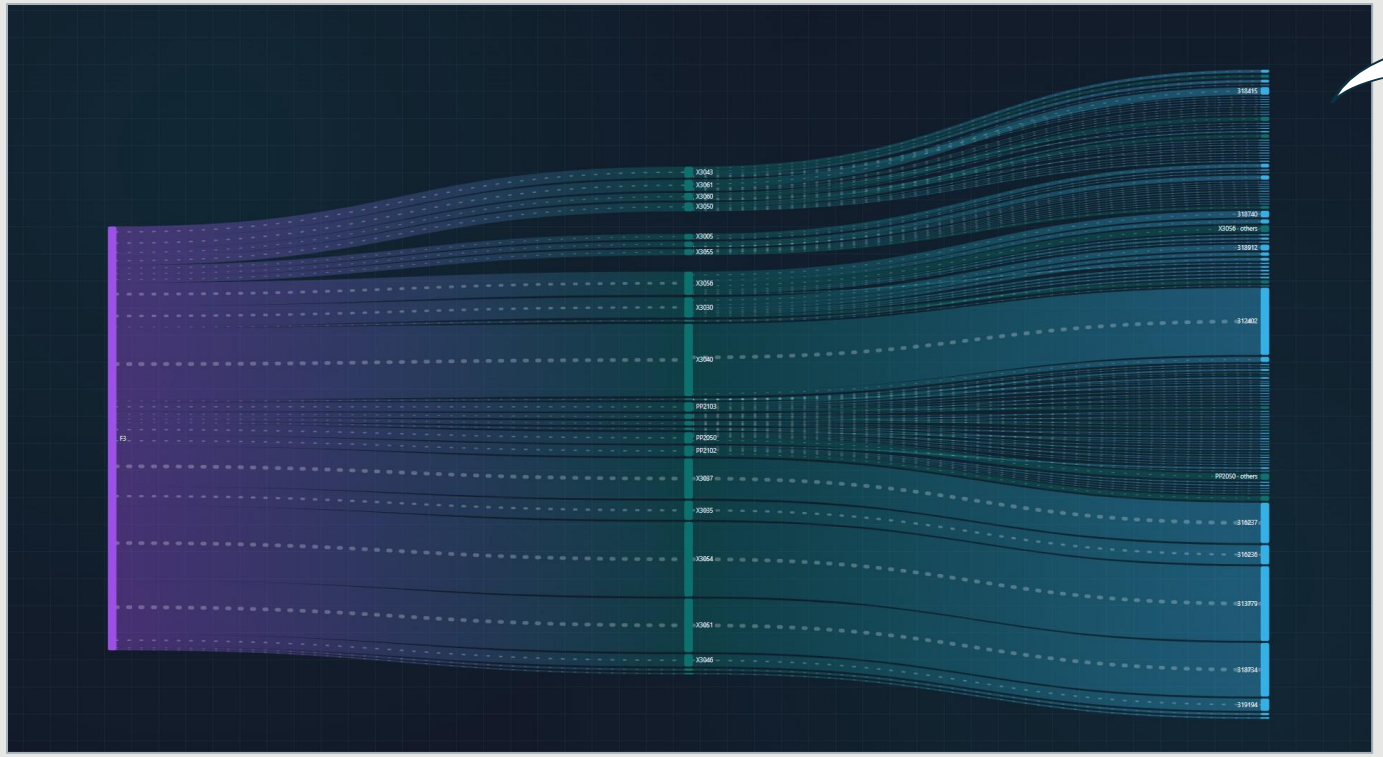


1. The route back to the feeder stays on screen, so the scope of what is shown is never in doubt.
2. Billed total for the group, against the check-meter reading, with the difference as a percentage.
3. Customers reporting consumption in the period.
4. Customers with nothing recorded — distinguished by colour and countable at a glance.

This is the level at which an inspection is actually briefed. The scope is a defined set of customers whose identities and locations are already held, which is why the same view is used both to decide that a visit is warranted and to prepare it.

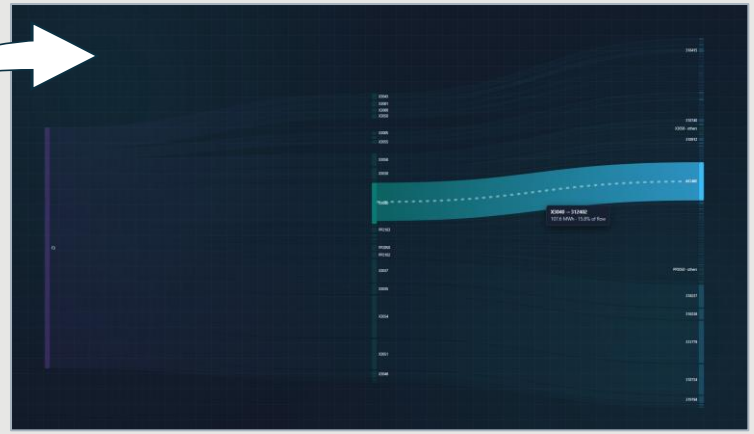
DISTRIBUTION OF ENERGY ACROSS THE FEEDER

The same network can be read as flow rather than structure. Band width is proportional to the energy carried, from the feeder through each transformer to the customers below.



Feeder, transformers and customer accounts, left to right.

Selecting a band names its two ends and its share of the total.



What this shows is concentration. Where a small number of paths carry most of the feeder, the utility knows which sections would have the greatest effect in the event of a fault.

RECORDED LOCATION OF METERING POINTS

Coordinates are held with each customer record and shown on selection, together with the other customers on the same transformer.



Identifying a suspect account was never the slow part of revenue protection. Locating the premises was, particularly where addressing is informal and the record sat in a different system from the consumption data.

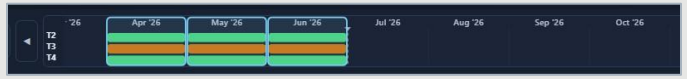
Because customer identity, the transformer above it and the recorded position are held together, a case can be prepared without consulting anything else.

Cases close to one another are visible together, so inspections can be grouped into a single round rather than scheduled one at a time. On a route of this size that is the difference between a morning and a week.

DATA COVERAGE AND COMPLETENESS

Before a result is produced the application reports what it holds: which source covers which period, and which import supplied it.





The same status stays in view while the analysis is being carried out.

Granularity is determined on import rather than declared. The application inspects how many distinct days appear for each meter and treats the file accordingly, so a daily export and a monthly one can sit in the same analysis.

Records that cannot be resolved to a feeder are collected separately and reported as a quality warning, which keeps a mapping omission visible rather than allowing it to reduce the billed total unnoticed.

A period with no data loaded is left empty. The application will not substitute the nearest available import, which is the usual way a reconciliation ends up quietly wrong.

Each block names the version that supplied it, so any figure can be traced back to a file. Where two imports cover the same period the analyst is required to choose between them, and the choice is stored with the analysis.

This matters most when a figure is challenged months later. The saved period can be reopened and will return the same result, because the inputs were recorded rather than implied.

It also changes the order of work. Completeness is established first, and analysis is only carried out on periods known to support it — rather than the reverse, which is how most manual reconciliations have historically been done.

MONTHLY OVERVIEW

Four indicators for the selected window: energy billed, energy supplied at the check meters, the difference between them, and how many customers reported consumption at all.





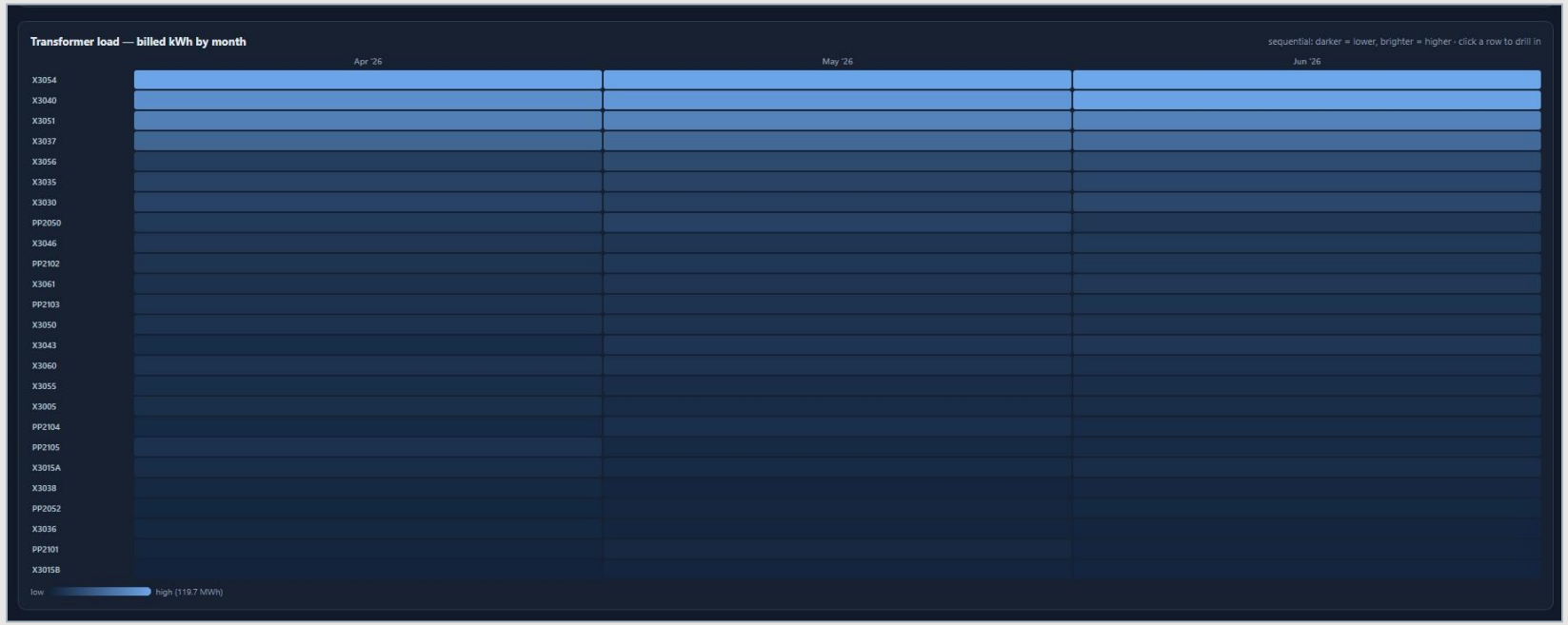
Each indicator carries its own trend. A single period says very little; the direction of movement across the window is what the utility acts on.

This is the first view opened each period and it sets the scope for everything after it — the window and feeder chosen here carry through to every other view.

The count of reporting customers sits beside the energy figures deliberately: a falling billed total means something different if the count fell with it.

TRANSFORMER LOADING

Transformers ordered by consumption across the selected periods, read left to right.



Selecting a row opens that transformer's own comparison beneath the grid.

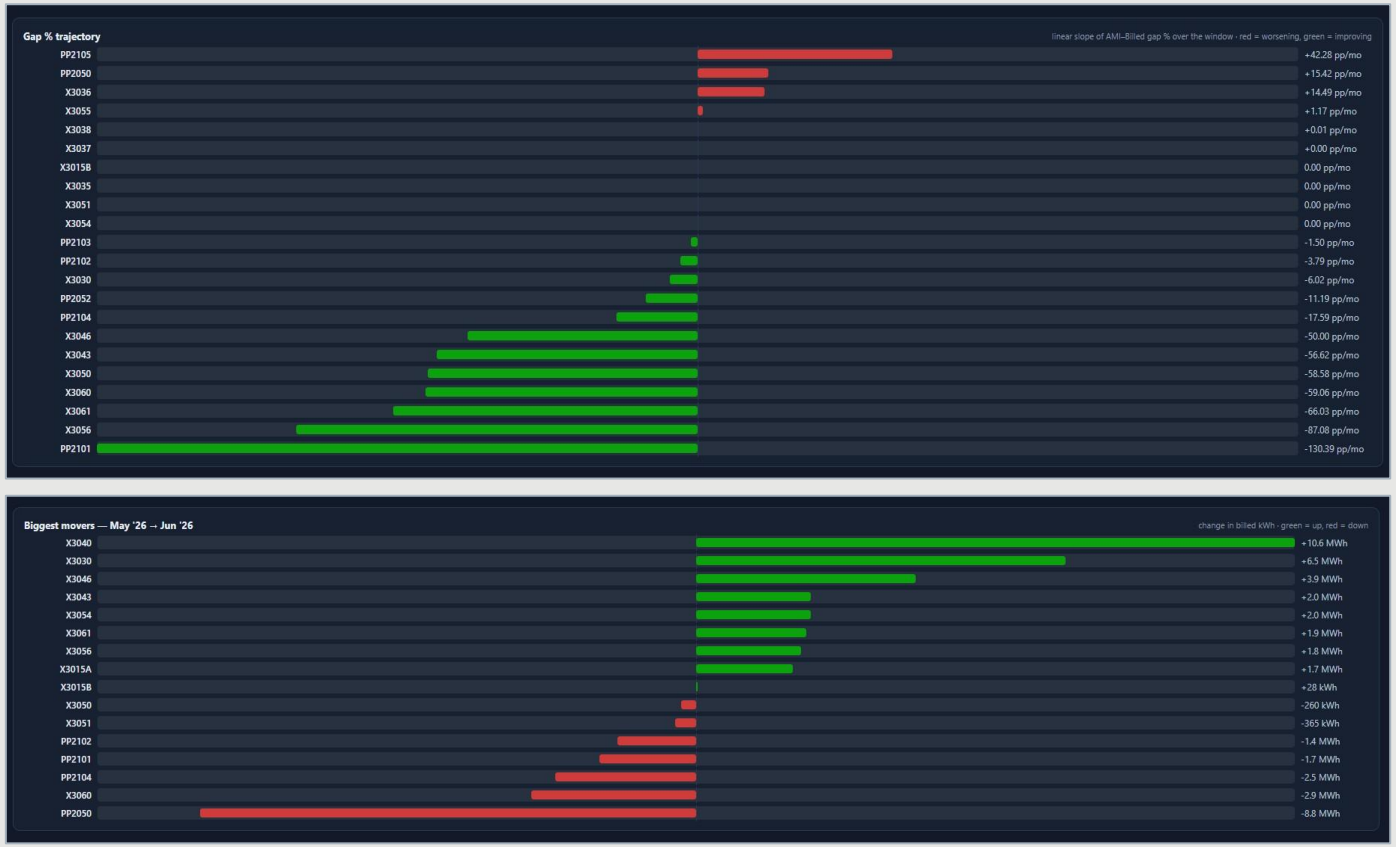
Ranking is automatic, so effort follows the energy rather than the order of the labels.

Reading across the window separates a transformer that is consistently large from one that had a single unusual period. That distinction decides whether anything needs investigating at all, and it is not visible from one period alone.

Used together with the trend view that follows, this establishes both the size of a transformer's contribution and the direction it is moving in.

CHANGE OVER TIME

A transformer with a persistent difference is a known condition. One where the difference is widening is a change, and it is the change that warrants attention first.



The upper view ranks transformers by the rate at which their difference is changing across the window; the lower one shows what moved between the last two periods.

Together they separate a standing problem from a developing one. A transformer that has always sat outside tolerance may simply be poorly metered; one that has moved there since the last period usually has a cause worth finding.

The same views are used afterwards to confirm that an inspection or a corrected record actually had an effect. Where it did, the improvement appears here in the following period — which is the only practical way to tell whether the work was worth doing.

TRENDS AND IDENTIFYING METERS THAT NEED ATTENTION

Customers are selected by how they report rather than by how much they consume, so that smaller accounts are not lost behind larger ones.

Meter anomalies — 59 flagged

silent = stopped reporting · drop = latest < 50% of its trailing median

ACCOUNT	TRANSFORMER	CLASS	TOTAL (WINDOW)	LATEST	FLAGS	TREND
318668	PP2105	Residential	3.5 MWh	629 kWh	drop	
316108	X3060	Residential	3.4 MWh	680 kWh	drop	
319406	PP2050	Residential	3.4 MWh	1.0 MWh	drop	
312275	PP2104	Residential	3.0 MWh	510 kWh	drop	
324952	PP2050	Residential	2.9 MWh	0 kWh	silent	
323521	PP2105	Residential	2.8 MWh	0 kWh	silent	
313415	PP2050	Residential	2.5 MWh	0 kWh	silent	
323080	PP2104	Residential	2.4 MWh	0 kWh	silent	
329714	PP2102	Residential	2.4 MWh	0 kWh	silent	
318488	PP2101	Residential	2.3 MWh	0 kWh	silent	
323386	X3056	Residential	1.9 MWh	68 kWh	drop	
327261	PP2102	Residential	1.9 MWh	374 kWh	drop	
315337	X3043	Residential	1.9 MWh	0 kWh	silent	
323464	PP2050	Residential	1.9 MWh	136 kWh	drop	
328902	PP2050	Residential	1.6 MWh	204 kWh	drop	
321696	PP2102	Residential	1.5 MWh	0 kWh	silent	

Accounts ordered by consumption in the window, with flag and recent trend.

No consumption reported

The meter has stopped reporting altogether. Communication failure, a stalled register and interference all present the same way and all require someone to attend.

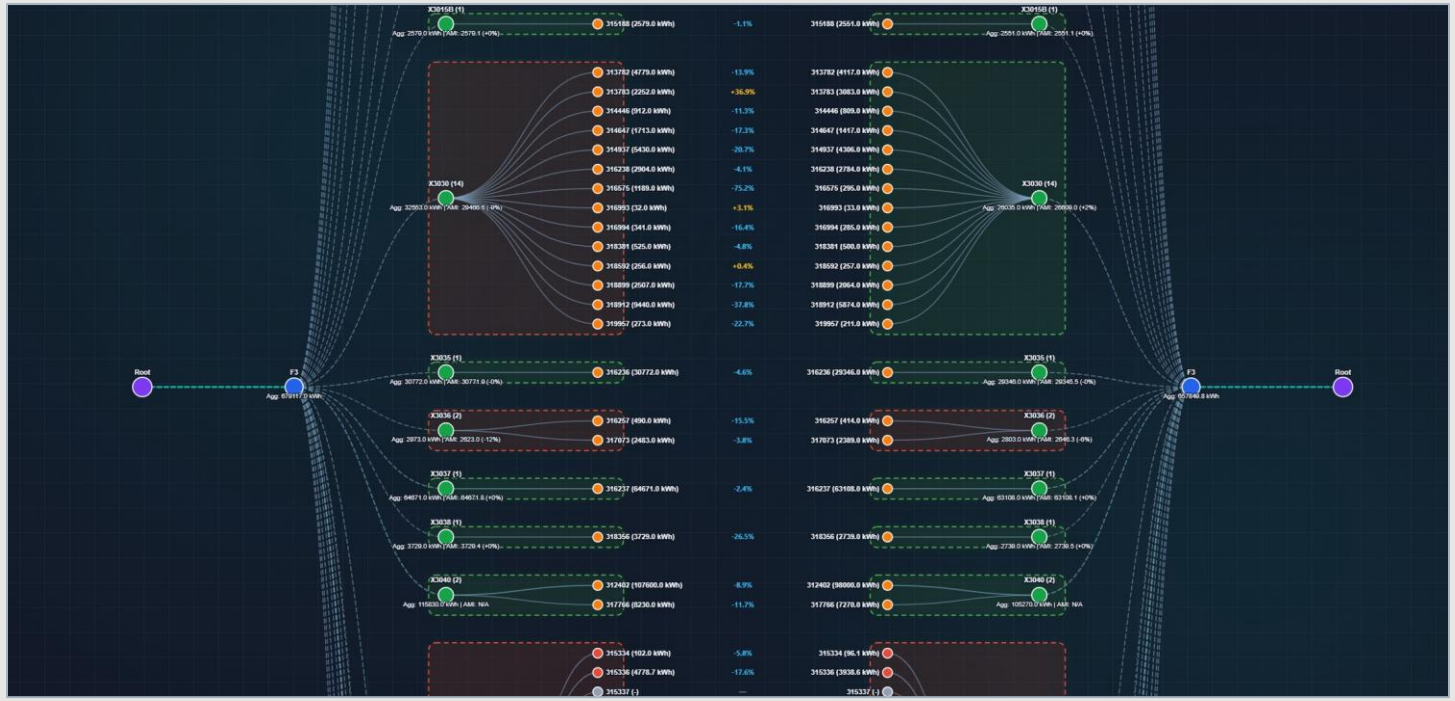
Below its own pattern

The latest reading sits well under this customer's trailing median. The comparison is against its own history, never against other customers, which is what keeps small accounts in scope.

The result is the sheet that leaves the office. Each line already carries the account, its transformer, the class of supply and the recent pattern, so no further preparation is needed before a crew is dispatched.

BENCHMARKING ANALYSIS AGAINST ANOTHER

Saved analyses are compared against a nominated reference — at feeder level, at transformer level, and down to the individual account.



The network shown in duplicate, with the difference between the two reported down the centre.

Search accounts | Account # or comma-separated list; substring match | Click an account in the first column for details & map.

Meter (Account)	QA Fixed AprJun (Ref)	QA AprJun	QA Jun	QA May
F3 › X3060 (30 meters)				
Σ Transformer: X3060 (30 meters)	40262.2 kWh	40262.2 kWh 0.0%	12094.5 kWh -70.0%	14998.1 kWh -62.7%
317502	80.5 kWh	80.5 kWh 0.0%	22.3 kWh -72.3%	—
316358	34.0 kWh	34.0 kWh 0.0%	34.0 kWh 0.0%	—
319475	1706.7 kWh	1706.7 kWh 0.0%	561.0 kWh -67.1%	590.5 kWh -65.4%
319476	2302.2 kWh	2302.2 kWh 0.0%	731.1 kWh -68.2%	622.1 kWh -73.0%
319477	1352.4 kWh	1352.4 kWh 0.0%	535.5 kWh -60.4%	377.2 kWh -72.1%

The same comparison in tabular form, searchable by account.

This is how a correction is tested. A revised mapping scheme can be set against the version it replaced and its effect measured rather than assumed — which matters, because not every correction improves the balance.

It also answers the question that follows any unusual month: did consumption really change, or did the data change? Comparing period against period at account level distinguishes the two.

The comparison exports to spreadsheet for distribution.

THE MONTHLY CYCLE

Three routines, carried out by different functions, each ending in something specific.

STAGE	RESPONSIBILITY	ACTIVITY	RESULT
Establish the period	**Analyst**	Import the month's files. Review what the application reports as covered. Where two imports cover the same period, choose between them. Save the selection.	A period that can be reported and later reproduced.
Locate the difference	**Revenue protection**	Start from the transformers whose difference is widening. Open each one, review the customers beneath it, and note those that have stopped reporting or fallen below their pattern.	An inspection schedule with identities and locations.
Correct the scheme	**Engineering**	Where a difference traces to a customer recorded under the wrong transformer, reassign the record, export the revised scheme and compare it against the previous version.	A network record measurably better than last month's.

The stages are separable. A period can be established without anyone investigating it, and the scheme can be corrected without waiting for the next month — but run together they leave each other in better condition.

WHERE THE APPLICATION IS USED

What was previously an occasional exercise, rebuilt from scratch each time it was asked for, is now a monthly procedure carried out on the utility's own equipment.

FUNCTION	USE
Management	A consistent monthly statement of feeder balance and the direction it is moving in.
Metering and operations	Early identification of meters that have stopped reporting or drifted from their established pattern.
Revenue protection	A defined inspection schedule with customer identity and recorded location attached.
Engineering	A mapping scheme corrected and version-controlled as part of routine work rather than left to age.
Analysts	The ability to reproduce any reported period exactly from the record.

No external service is required to operate the application, and the operating manual is held within it. The scheme, the imported data and the findings each improve on every cycle, which is what distinguishes a procedure from a study.



Consumption distribution across the served area.

The platform does not remove the need for field work.
It decides where field work should go, and it records what was known at the time the decision was made.

That record is what allows a figure to be defended six months later, and what turns each month's corrections into an improvement the following month can build on.