HYBRID ENERGY / ENGINEERING CASE STUDY

Hybrid Energy on Mobile Sites

Getting the most from generator, solar and battery power

For a company that supplies mobile facilities, The Propel Group brought generator, solar, battery and individual circuit data together in one application. It shows operators how to optimise fuel usage, run regime(s) and associated operating expenditure, and equipment owners see how each facility is performing and when maintenance is required.

GOING DEEPER

Time-aligned system and circuit telemetry, rule-based event detection, learned consumption profiles and optimisation, with visual reporting.

THE VALUE CASE AT A GLANCE

The problem

Hybrid sites often burn more fuel than they need to, and customers increasingly want proof of fuel and carbon savings.

The value

Lower fuel use and running costs, and reliable reporting that helps win and retain contracts.

Extra value, at little or no extra cost

The same data shows generator running hours for maintenance planning, and helps size generators and batteries correctly for the next job. Carbon reporting can be offered to customers as a service.

Why Propel

Practical experience of running energy systems, combined with engineering calculations that can be checked, rather than AI estimates that have to be taken on trust.

Concept illustration created for this case study; not a photograph of a customer's site.

The meter reading does not tell the whole story

A facility's total energy use does not show whether the generator ran efficiently, whether the battery was used well, or whether solar power was available at the right time. Readings for the whole system and for individual circuits each tell part of the story.

Propel's work brings those readings together for two groups: the operators looking into loads and generator behaviour, and the teams explaining energy, cost and carbon performance to customers. Both need an agreed basis for comparison, assumptions they can see, and a clear link between the analysis and a practical change on site.

THE APPROACH

How it works

The application puts whole-system and circuit readings on the same basis, picks out operating events, estimates performance and looks for better ways of running the equipment. Separate screens then support day-to-day investigation, planning and customer reporting.

THE OPERATIONAL THREAD

Collect
System and circuit data

Analyse
Patterns and events

Compare
Against a clear baseline

Explain
A view for each team

01

Put every reading on the same timescale

Readings from each site, source and circuit keep their identity and are lined up against the same clock. Historical data and regular new readings go into the same store. Differences in how often each meter records are handled carefully, so a change in recording interval is never mistaken for a change in consumption.

GOING DEEPER

The ingestion layer retains source, site and circuit identities, standardises timestamps and handles source granularity explicitly in a common time-series store.

02

Find the savings opportunities

Simple rules pick out patterns such as a generator running at low load, restarts that could have been avoided, and times when solar power may have been wasted. The system also looks back at what actually happened and works out how the generator and battery could have been run better, within their real limits.

GOING DEEPER

Rule-based event detection, plus a hindsight optimisation model that compares alternative dispatch against observed demand and solar within configured battery and generator limits.

03

Learn each site's pattern of use and plan ahead

The system learns each site's typical daily pattern of demand and how much it varies. A day-ahead planner then combines expected demand and solar energy projection with the battery's current charge to suggest a workable generator regime.

GOING DEEPER

Learned real-world equipment performance consumption profiles; a day-ahead planner combining demand and solar forecasts with battery state.

04

Explain the figures in plain terms

Savings are measured against a clearly stated comparison with running on the generator alone, and split into the effects of fuel choice, solar power and how the equipment was run. Where a written summary is useful, AI puts the finished figures into plain language. It is instructed to explain them, not to calculate or add figures of its own.

GOING DEEPER

A savings model against a stated generator-only baseline with separate attribution of fuel, solar and dispatch effects; optional language-model narration of precomputed figures.

TECHNOLOGY AND TRUST

Black box or glass box?

A black box claim that fuel has been saved is difficult to question. Propel's approach keeps the measurements, assumptions, calculations and comparisons open to inspection. Users can see the baseline, what drives each estimate and what still needs to be checked against actual operation.

THE TYPICAL BLACK BOX

Question or data

"Here is the answer"

Evidence: Not shown

Verification: You have to take the saving on trust

Decision: Made for you

THE PROPEL GLASS BOX

Evidence
Site readings and equipment settings

Verification
The baseline and the calculation behind every figure

Decision
Look into a period, or plan the next schedule

For example, an estimated fuel saving can be traced back to the site's demand, its equipment and the stated comparison with generator-only running, rather than accepted without explanation.

THE TECHNOLOGY, IN PLAIN TERMS	WHAT IT DOES
One timescale for every reading Time-series integration	System and circuit readings keep their source and are lined up in time, so energy totals add up and comparisons between screens are fair.
Engineering calculations Numerical models and event analysis	Adjustable fuel and energy models do the calculations. Simple rules pick out operating patterns, and separate breakdowns show what solar power, equipment scheduling and fuel choice each contributed.
Learning each site's pattern Statistical learning	Records each site's usual pattern of demand. Testing on days not used for learning, against a simple comparison, shows whether the forecast is genuinely useful.
Looking back and planning ahead Retrospective and forward optimisation	Looking back shows what was possible with hindsight; planning ahead uses forecasts and the battery's current charge. The two are kept separate, so hindsight is never presented as something that could have been predicted.

Note: the calculations are done by the engineering models. AI is used only to explain the results in plain language, and its summaries can always be checked against the figures.

THE USER EXPERIENCE

The system and the decisions, on screen

The application has separate screens for running the site and for reporting to customers. An energy-flow diagram shows the whole system; charts and event lists explain performance over time. Patterns of demand and a proposed schedule link what happened to the next operating decision.

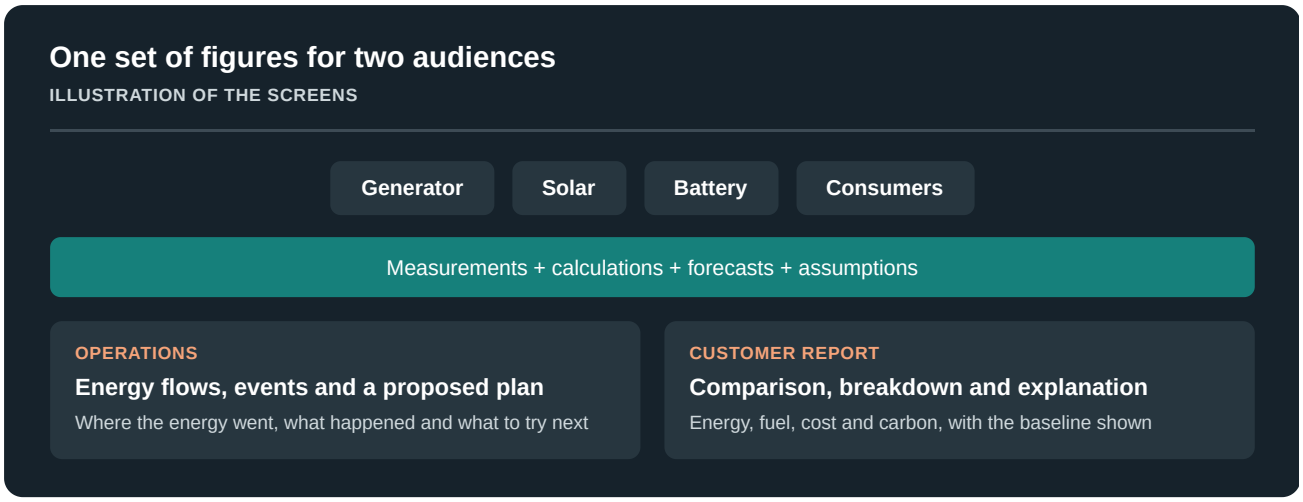

Illustration based on the application. No site names, operating data or savings figures are shown.

Operations engineer

Look at generator runs, battery use, alarms and patterns of demand, find the periods worth investigating and see the readings behind them.

Planner

Compare the proposed schedule with expected demand, solar power and available battery charge. The plan is guidance; how useful it is depends on the quality of the forecast and whether the team can act on it.

Customer reporting team

Explain performance with a clear breakdown of energy, fuel, cost and carbon, with the baseline and assumptions shown alongside, so the figures stand up to questioning.

A comparison is only as good as its baseline.

Fuel estimates, battery losses, equipment ratings, prices and emissions factors all affect the result, and all can be adjusted. Modelled savings and savings identified with hindsight are always kept separate from metered fuel savings and from what could realistically have been predicted.

BUSINESS VALUE AND INDUSTRIAL RELEVANCE

The value on site and for customers

Propel brought together data collection, adjustable analysis, learning of demand patterns, scheduling and clear reporting for a mobile facilities company. The work links an explanation of past performance to better operation in future and clearer discussions with customers.

FOR OPERATIONS

- **Less unnecessary generator running.**
  Low-load running, restarts and the loads behind them are identified, so changes can target a specific cause.
- **Effort where it pays.**
  Site history, events and alternative schedules help teams decide which changes to try, and distinguish a saving on paper from one that can realistically be achieved.
- **The hybrid system run as one.**
  Expected demand, solar power and battery charge are considered together when planning, so all three are used within their limits.

FOR THE BUSINESS AND ITS CUSTOMERS

- **Reporting that stands up to questioning.**
  Energy, fuel, cost and carbon comparisons come with the assumptions and breakdowns shown, giving a more credible basis for discussing the service.
- **A stronger offer to customers.**
  Clear evidence of efficient, lower-carbon operation helps win and keep contracts.

Beyond mobile facilities

The same approach suits temporary power, construction sites, remote operations and any site with a mix of energy sources. It starts with a clear picture of where the energy goes and a sound baseline, then adds forecasting and scheduling only where they improve a particular decision.

GETTING STARTED

Propel's Northstar Framework® starts by agreeing the value to be delivered, such as a fuel, cost or carbon target, then builds the system with the people who run the sites. A first working system typically takes one to two weeks, and measurable value four to eight.

Engineering case study, September 2026. The customer's identity has been withheld. The benefits described are what the system is designed to deliver; no measured results are reported here. thepropelgroup.com