



• FIELD-TESTED IN UKRAINE

The home that doesn't ask.

One local brain for heat, sun, storage and two cars — and a house that is ready before the grid goes dark.



THE PROBLEM

Five systems. One connection. Nobody in charge.

A boiler, an electric heater, a solar inverter with a battery, room thermostats — and now two cars. Each has its own app and its own idea of when to draw power. On a January evening they can ask the connection for more than it was ever sized to give.

THE PRINCIPLE

Complexity has to stay inside the machine.

Every fifteen minutes Tesseract solves the next twenty-four hours again, from scratch.

Inverter, battery, heat circuits, boilers, chargers, the generation forecast, the weather, the tariff, the risk of an outage. Thousands of variables, hundreds of constraints. The people at home see none of it — they see a warm room, a car ready at nine and a bill they no longer check twice.

15_{min}

re-planning cycle

24_h

optimisation horizon

3

controls a person needs

 Tesseract is named after the four-dimensional cube: an object you never see whole, only through its projection. The interface is that projection.

RESULT

80%

less electricity drawn from the grid than in the same house before automation.

BEFORE AUTOMATION



100 % from the grid

WITH TESSERACT



20 % from the grid · 80 % own generation, storage and load moved into cheap hours

Where the number comes from

Own generation is used where it appears, not where someone remembered it. The battery charges in the cheapest hours and discharges in the dearest. Heat circuits work with the inertia of the building, not against it.

What it cost the residents

Nothing. No schedule to keep, no instructions on the fridge. The best compliment the system received was a question: "Is it actually doing anything?"

1

heating season of continuous operation

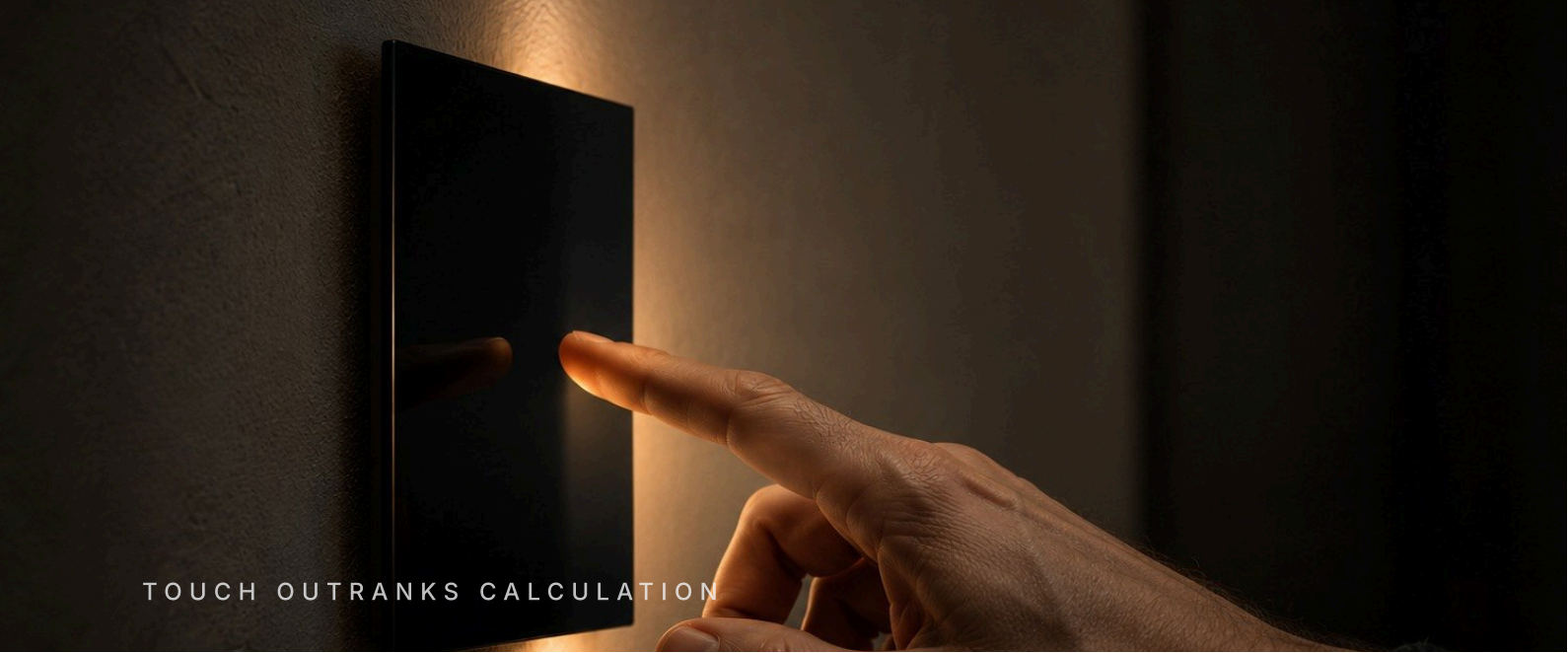
35 040

optimisation problems solved in a year

<1/week

average interventions by the residents

REFERENCE SITE · UKRAINE

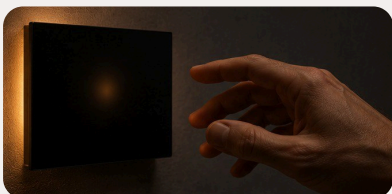


TOUCH OUTRANKS CALCULATION

HUMAN PRIORITY

Three things a person can do. And nothing more.

We deliberately gave no access to weights, coefficients or schedules. Instead of a panel with thirty parameters — three gestures, each clear without explanation.



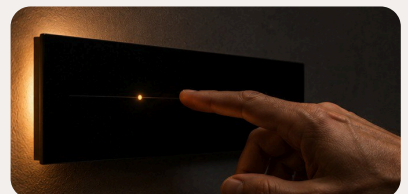
Do it your way

A manual change runs at once. No warnings, no “are you sure?” — a touch outranks any calculation in progress. The plan returns by itself, smoothly, when the action ends.



One dial

Economy ↔ Comfort, separately for day, night and alert. Everything the system believes about your priorities, in one element. Nothing hidden, nothing that takes more than a second to change.



Agree

Every few weeks it notices a pattern and asks: “You raised the evening temperature several times. Make evenings warmer?” One touch — the only way to change what it believes about you.

- A manual action is carried out immediately. Always.



KEY DECISION

The system never changes its goal in secret.

Many “smart” homes learn quietly: they observe, draw conclusions and slowly change behaviour — until one evening nobody can say why the bedroom is cold. We took the opposite path. Observations accumulate, but none of them becomes a decision on its own.

Observation

corrections,
choices, context



Accumulation

in the background,
no effect



Question

one, at most every
two weeks



Change

only after your
consent

A refusal is an answer too: next time the system simply asks later.

CONSEQUENCE

The house never does what you did not agree to

Every change can be named aloud and undone

No more than one suggestion every two weeks

Over a year, the residents used the interface less than once a week on average. Not indifference — there was simply no need to step in.

INSIDE

What the residents never guess.

Every fifteen minutes the system weighs millions of possible trajectories and keeps one. Every ten seconds it renews what it has asked for. Every second it guards the connection.

01 Intentions

"car ready at 9:00" · "21° in the bedroom" · "economy"

02 Preferences

what matters more right now — separately for day, night and alert

03 Optimiser

MILP · 24-hour horizon · re-planned every 15 minutes

TAKEN INTO ACCOUNT

Generation forecast — from a model of the array

Thermal inertia of every circuit

Tariff and the state of the grid

Battery wear — a budget of cycles

Each car ready by its departure

Outage risk and the alert level

NEVER LEARNS

Safety limits. The minimum reserve in the battery. The temperature the house never drops below.

Enough charge in every car to evacuate. The time by which a car must be ready. These are engineering constants, not preferences: the optimiser may misjudge a forecast, but never a limit — the constraints hold, or the problem is declared infeasible.

15 min

the plan

10 s

each decision

45 s

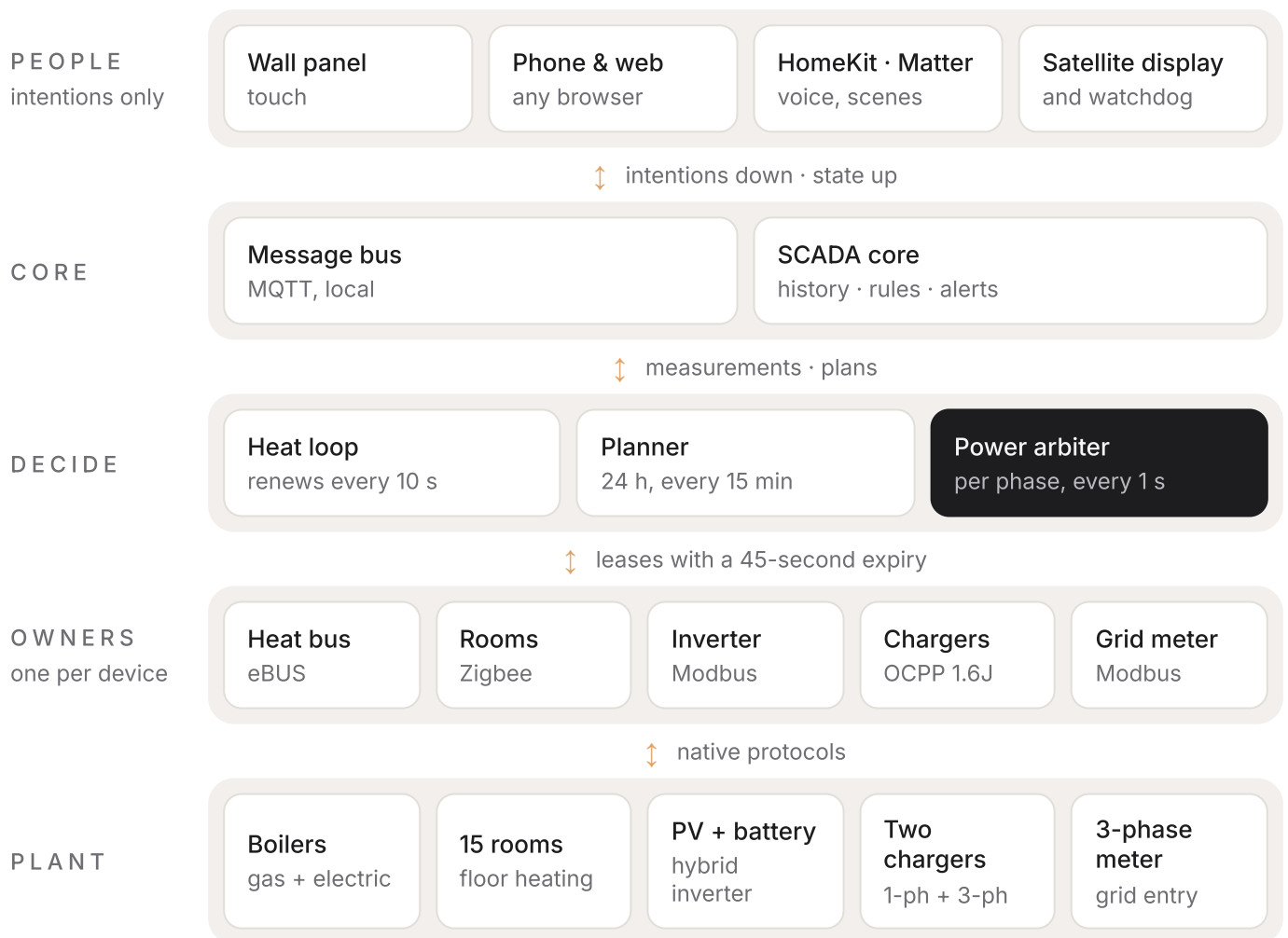
life of a command

1 s

grid protection

One device, one owner.

Each piece of hardware has exactly one process that talks to it. Everything else listens. That single rule removes the conflicts that make smart homes unpredictable.



Local

One computer on the wall runs everything. The cloud is optional.

Writes from inside

The network can read. Only processes on the device itself can command.

Vendor-neutral

New hardware means one new owner process. Nothing else changes.



SAFETY BY DESIGN

Silence is the off switch.

Most systems try to detect failure. Tesseract does not have to: when it stops talking, the plant stops being asked — and returns to rest.

Commands expire

Every request to a boiler, a relay or a charger is a lease of 45 seconds. Proven on the wire: stop renewing, and the plant goes quiet by itself.

Unknown is never zero

A stale reading is treated as the worst case. A charger the system cannot hear is counted at full power.

The network only reads

Control listens on the device itself. Phones and panels send intentions, never commands.

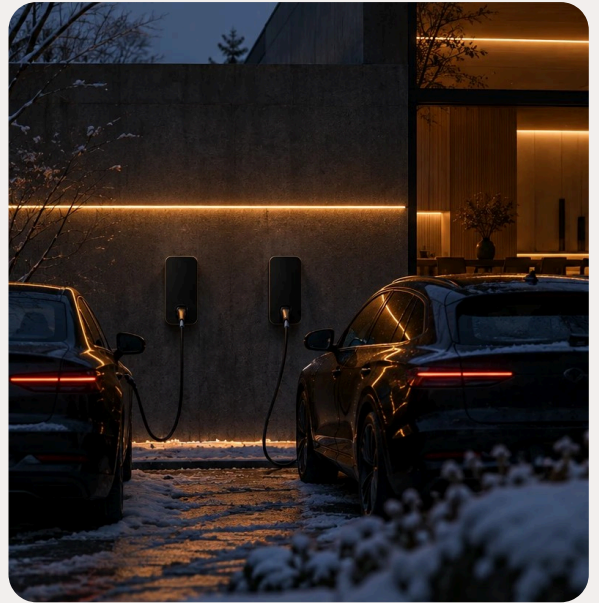
Hardware has the last word

The breaker, residual-current protection and each charger's own limits sit below the software. Software can only reduce.

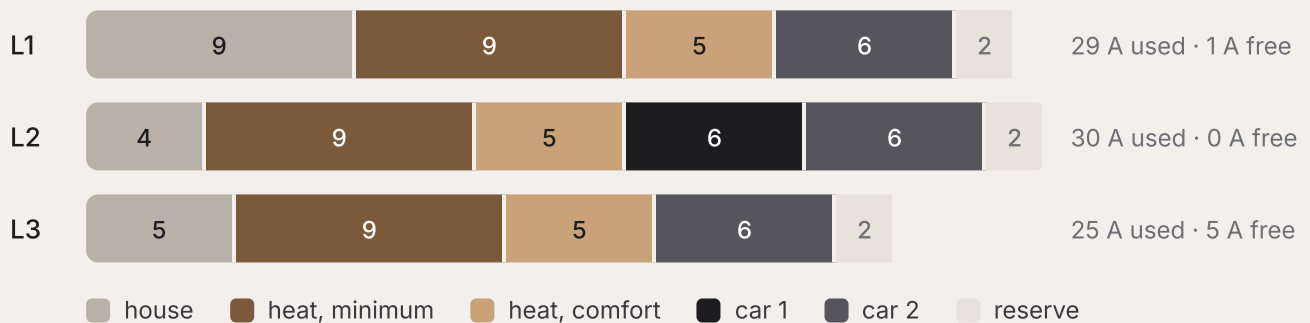
TWO CARS, ONE CONNECTION

Every amp, on every phase, accounted for.

On a January evening an electric boiler and two chargers can ask for 32 kW from a 22 kW connection. A meter at the grid entry measures every phase each second; Tesseract divides what is left and never promises more than the wire can carry.



A WINTER EVENING · 3 × 32 A · AMPS PER PHASE



WHO GETS POWER FIRST

- | | |
|---|---|
| <ol style="list-style-type: none"> 1 Protect the connection
overload shed within a second 2 Keep every room above frost
heat itself is never cut 3 Hot water minimum
and legionella cycles 4 A car below its evacuation reserve
or one that must leave soon | <ol style="list-style-type: none"> 5 Every car gets 6 A
the minimum to charge 6 Comfort from the electric boiler
gas covers the rest 7 Faster charging
up to each charger's limit 8 Sunshine
battery > car > heat store |
|---|---|

- When the connection is full, heat moves to gas. The house stays warm, both cars keep charging and the breaker never trips.



CONTEXT

Designed for a country where power is not a given.

European energy systems optimise cost. A Ukrainian one has to optimise availability as well.

The alert level is not a phone notification but an input to the optimiser. It raises the battery's minimum charge, shifts heat cycles and brings charging forward, so every car keeps enough charge to evacuate. The house prepares for an outage before it is announced — so quietly the residents do not notice.

THE SKY · 48-HOUR FORECAST

Night or sun

Charge tonight only what tomorrow's sun cannot deliver before you leave.

Frost ahead

The floor slab is warmed a day early — concrete answers in days, not hours.

An honest thermometer

When the sun heats the outdoor sensor, the curve follows the forecast.

SIREN · NATURAL HAZARDS

Air-raid alert

Battery to full, every car to its evacuation charge, hot water to the top of its band.

Storm, flood, ice, snow

Official warnings keep the house blackout-ready for as long as they last.

Strong earthquake

The gas burner is released until the owner confirms.

0

heating interruptions in the heating season

<1_s

switch to backup power, unnoticed by appliances

100%

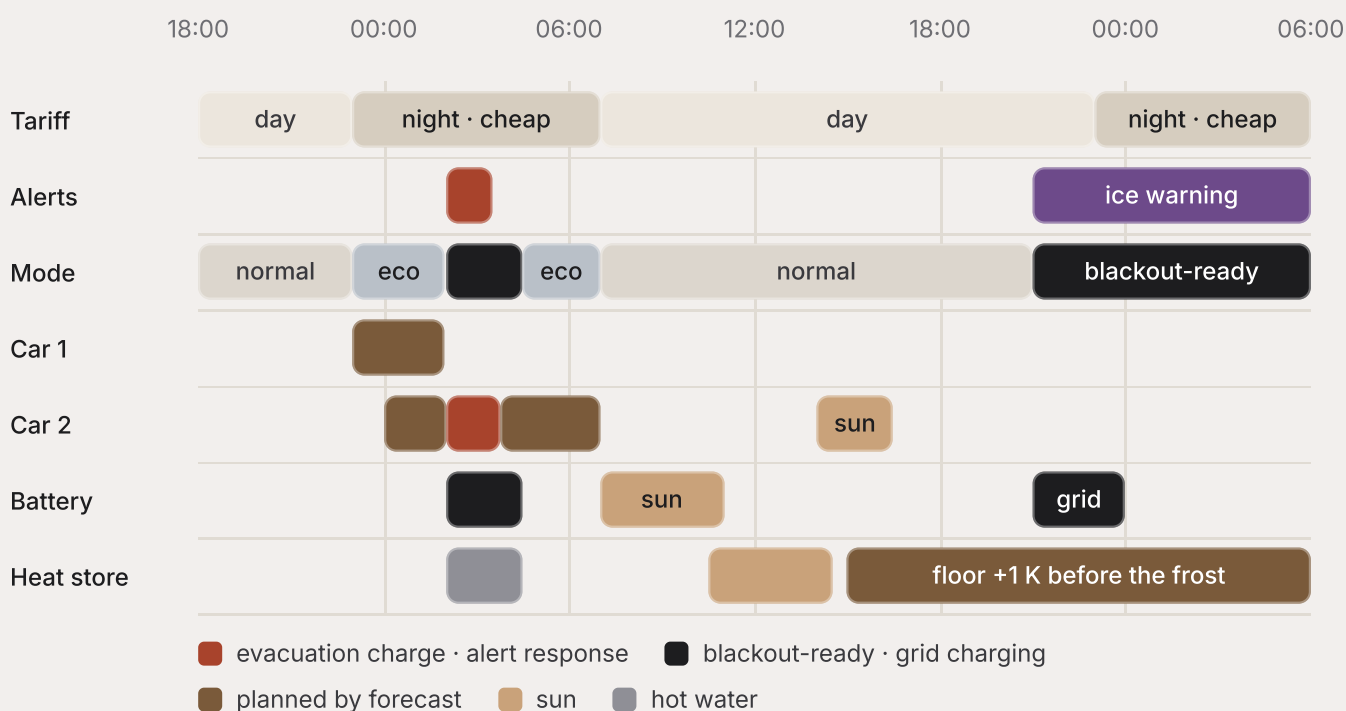
local control — the house works without the cloud



A DAY

A day in which nothing happened.

The best day of the system looks uneventful. The house warmed up before dawn while the grid was cheap; midday went into storage; the evening peak passed almost without touching the grid. The residents did nothing — even on this one, with an air-raid alert at two in the morning and frost on its way.



02:00

Air-raid alert. In seconds the house is blackout-ready: the battery takes grid power and the second car is charged to its evacuation reserve first.

07:00

The forecast was right. The battery fills from the roof, the surplus goes into the heat store, the second car takes its share in the afternoon.

21:00

An official ice warning. Blackout-ready again — and the floor is already a degree warmer, a day before the frost.

ILLUSTRATIVE WINTER PROFILE



FIELD TRIAL · UKRAINE

Proven where power is not a given.

Tesseract runs a real family house in Ukraine on one local computer — in a country where outages, air-raid alerts and severe weather are part of the week.

JUN 2026

Listening

Tesseract joins the heating bus of the house and learns every message on it.

AUG 2026

In charge

The factory controller is removed. Tesseract becomes the only controller of two boilers, an 800-litre buffer, a 200-litre cylinder and fifteen rooms.

SEP 2026

The whole house

Its own Zigbee stack, inverter control, the forecast and alerts for air raids, earthquakes and natural hazards — all on the same box.

85 years

of real hourly weather
replayed against the
digital twin

40 years

of simulated bus
faults survived

255

automated tests
before every release

100%

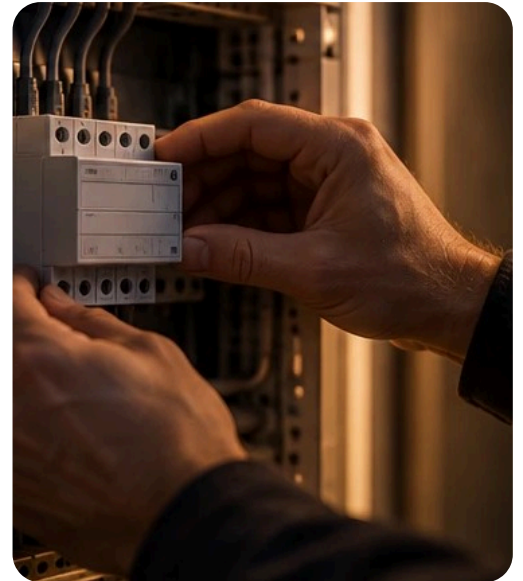
local control — the
cloud is optional

In the field today: heating, rooms, solar, storage and one charger. In pilot: the per-phase power arbiter for two chargers and the grid-entry meter.

FOR INSTALLERS

Speaks the language of what is already on the wall.

No proprietary sensors, no gateway rip-out. Tesseract talks to the equipment in its own protocol and leaves every factory safety in place.



WORKS WITH

Heating	Vaillant gas and electric boilers, VR 71 station	eBUS
Rooms & sensors	Thermostats, valves and sensors — 4,000+ devices from different vendors	Zigbee 3.0
Solar & storage	Deye / Sunsynk hybrid inverters	Modbus
EV charging	Tesla Wall Connector Gen 3 · any OCPP 1.6J charger	HTTP · OCPP
Grid	Three-phase energy meter at the grid entry	Modbus
Weather & alerts	Forecast, official weather warnings, earthquakes, air raids	HTTPS · optional

01

Mount

The core and the meter go into the distribution board.

02

Connect

Heating bus, radio, inverter, chargers. No cloud accounts.

03

Describe

One line per element in one plant file. No code.

04

Shadow

For a week it shows what it would do. Then you arm it.

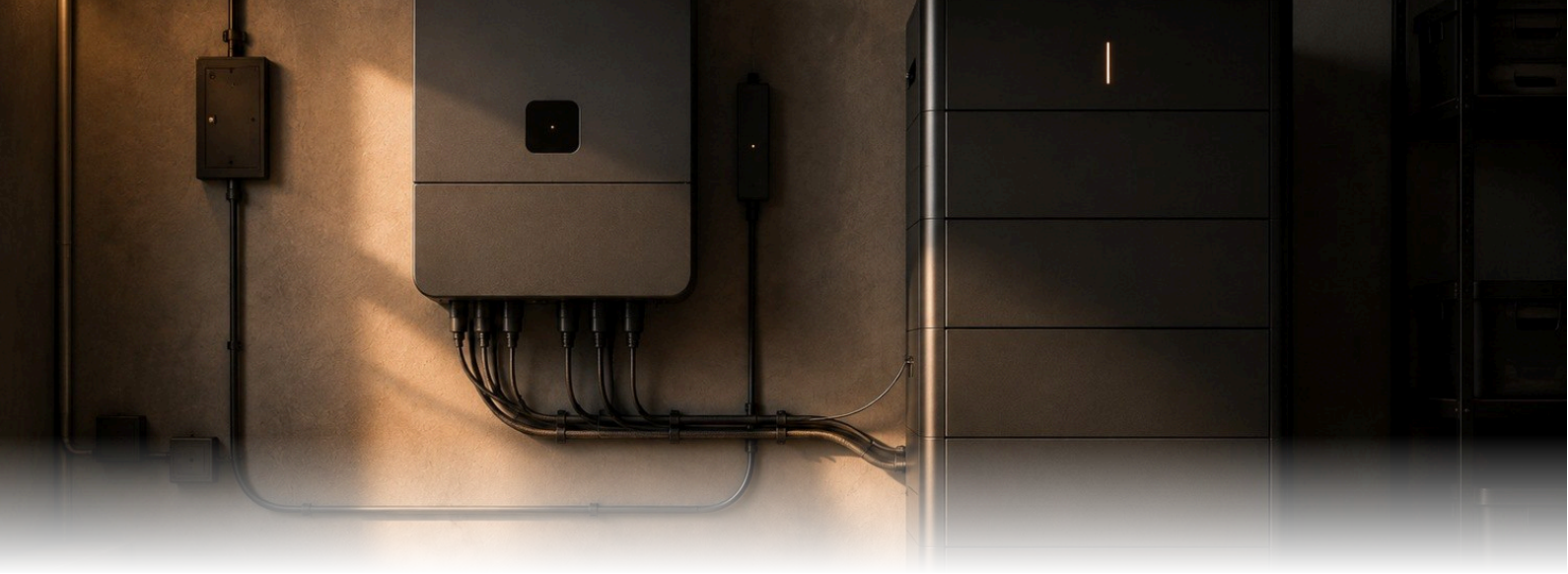
24_s

to rebuild a failed memory card from seed and backup

1_{file}

describes the whole plant, one line per element

Vaillant, Deye, Sunsynk and Tesla are trademarks of their owners. Tesseract is independent and not affiliated with them.



PLATFORM

Not a product for one house.

The same core runs an apartment, a private house and a ten-megawatt industrial battery. From 5 kWh to 10 MW, the constraints and the scale change — not the principle.

Vendor-independent

Inverters, heat pumps, boilers, thermostats, chargers and meters from different makers work as one system.

Industrial foundation

Built on an industrial-grade SCADA platform. The home system inherits its reliability requirements — not the other way round.

Data stays at home

Optimisation runs on a computer in the house. The cloud is not a condition for the house to work.

ROADMAP

NOW

Field trial in Ukraine: heating, rooms, solar, storage and EV charging.

NEXT

Per-phase arbiter for two chargers and the grid-entry meter, in pilot.

THEN

Installer kit, certification and a first pilot series.

Figures in this brochure come from the reference site — a private house in Ukraine with a PV array, a hybrid inverter, a battery, heating circuits and EV charging — compared with the same house before automated control. Results elsewhere depend on the equipment, the building and the tariff.

PARTNERSHIP

Let's build the next reference site together.

Tesseract is developed by Bohemia Automation — pre-engineered solutions for industrial integrators.

OPEN TO

NDA and data exchange

A joint pilot on an operating site

A laboratory validation campaign

A joint proposal — Innovate UK BIP CR&D Round 3, Horizon Europe, EIC

Installers and distribution partners in Italy and the EU



Ing. Maxim Sytnychenko

CCO · Bohemia Automation

maxim@altertech.com

+420 774 253 077

E-Innovation Centre, Priorslee, Telford,
United Kingdom, TF2 9FT



SCAN TO SAVE THE CONTACT

Visit us at the stand for a live view of the reference house: the plant, the plan and every decision, as it happens.

The most complex system in
your home should look like a
light switch.