

SERIES-HYBRID · ELECTRIC-PRIMARY · RIDE-BY-WIRE

# THE BAJA DUCATI



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A machine that reads Ducati and survives the desert.  
The honest engineering read — architecture, suppliers,  
lead times, cost, and the hard parts named as hard.

THE VERDICT, IN ONE LINE

# Buildable — with caveats, as a running prototype. Not a production machine.

**E**very subsystem in this document exists as real hardware from a real supplier today.

The engineering is not in inventing components; it is in packaging two energy systems into one motorcycle without wrecking the mass centralization that makes it read Ducati, and in sealing and cooling that machine against fine sand and desert heat. Those are the two hard problems, and they are hard, not hand-wavable.

The critical path is the frame-and-packaging integration and the range-extender genset, for which no off-the-shelf motorcycle-scale unit exists. This is exactly the risk profile a strategic investor should want: the risk lives in **integration and engineering execution**, not in unproven physics or unobtainium parts. That is a fundable risk.

● BUILDABLE — WITH CAVEATS

PHYSICS: PROVEN

RISK: INTEGRATION

**Why series-hybrid.** *Because the engine never touches the driveline, the packaging becomes a free optimization instead of a chain-constrained one. That single decoupling is what makes the Ducati read resolvable rather than merely stylable.*

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THE MACHINE, AT A GLANCE

|                  |                      |
|------------------|----------------------|
| Topology         | Series hybrid (REEV) |
| Drive            | Electric-primary     |
| Range extender   | Small ICE genset     |
| Control          | Ride-by-wire         |
| Target mass, wet | ~200-240 kg          |
| Prototype cost   | €350k-€800k          |
| To desert test   | ~14-20 months        |

Truth standard: every load-bearing spec, supplier, and lead time traces to a source fetched for this brief, or is written as an honest range with its basis named. Estimates are marked as estimates.

# Two machines in opposition — and a deliberate re-mapping, not a compromise.

Stated the way an engineer would defend it to a room that knows bikes cold.

“Ducati-style” is road-race DNA — a rigid trellis frame, a low and forward mass centroid, the engine as a stressed member, wheels tucked tight under a compact wheelbase. Baja is the physical opposite: 300 mm of wheel travel, a tall stance, a long wheelbase for high-speed stability over whoops, wide flotation over soft sand, and *everything sealed* against dust that behaves like a fine abrasive slurry.

The resolution is not a middle point between the two. It is a deliberate re-mapping of which Ducati cues are **visual and architectural** — and are kept — and which are **dynamic**, and are discarded for desert physics. The trellis-frame language, the tank-to-tail line, the naked-mechanical aesthetic, and the visually centralized mass all stay. The low stance, the short travel, and the tarmac-not-dust sealing philosophy all go.

The series-hybrid architecture is what makes this *resolvable* rather than merely *stylable*. Because the wheels are driven by an e-motor and the engine never touches the driveline, the designer is freed to place the range-extender genset wherever the mass budget wants it, not where a chain run demands it. That decoupling is the single most important enabling fact of the whole machine — and the honest answer to the insider who asks why not a parallel hybrid, or a simpler pure-EV.

**The magic:** *Ducati language on rally-raid proportions. Not a low sportbike given knobbies — a tall, long, wide-footed desert machine wearing a trellis and a tank-to-tail line.*

## KEEP — READS DUCATI

Steel trellis tubework, visible and mechanical · the tank-to-tail line · mass visually centralized around the mid-frame · naked-mechanical aesthetic · single-sided swingarm cue, if rear packaging allows.

## DISCARD — WOULD KILL IT IN THE DESERT

The low stance · the short travel · the tight low-and-forward tuck of sprung and unsprung mass · the sealed-for-tarmac-not-dust philosophy.

## WHY NOT PURE EV?

The 200-mile-no-charger reality is met by carrying *fuel*, not an impractically large battery. The pack is sized for the dynamic demand — peak power, regen, thermal buffer; the fuel carries the energy for range. That is the correct division of labour.

# The wheels are only ever driven by the electric motor.

Series-hybrid (range-extended EV). The engine has no mechanical path to the ground – it spins a generator at its efficient RPM to feed the DC bus and top up the battery.

## POWERTRAIN TOPOLOGY – ENERGY PATH

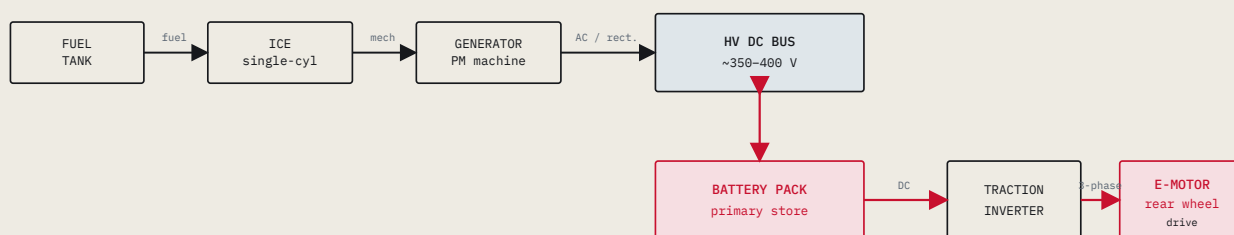


FIG. 02.1 – THE DEFINING PROPERTY OF A SERIES REEV: THE ENGINE CHARGES, THE MOTOR DRIVES. RED PATH = THE TRACTION LOOP THAT NEVER DEPENDS ON THE ENGINE.

### 1 • TORQUE CONTROL IN SAND

E-motor torque is commanded electronically at millisecond resolution. In soft sand – where the line between drive and dig-in is a few percent of wheelspin – the slip loop meters torque to a slipping wheel far faster and finer than any cable-and-butterfly engine. A genuine functional advantage, not a marketing line.

### 2 • RANGE WITHOUT CHARGERS

The battery is sized for the dynamic demand; the fuel carries the energy. The 200-mile-no-charger desert reality is met by carrying fuel, not by an oversized pack. This is the correct, defensible division of labour – and the honest “why not pure EV.”

### 3 • THE GENSET RUNS AT ONE POINT

Decoupled from road speed, the engine runs at or near its single best-efficiency point. A small engine does the work of a much larger road engine, which is why the efficiency and emissions story is defensible to an insider.

## The one enabling fact.

*The engine never touches the ground – so the machine’s mass can be placed by the physics of handling, not by the geometry of a chain run.*

**~15–25**

KW MECHANICAL –  
GENSET SIZED TO  
CRUISE, NOT PEAK

**~350–  
400**

V DC BUS –  
BATTERY, INVERTER  
AND GENERATOR  
MATCHED

**0**

MECHANICAL LINKS  
FROM ENGINE TO  
WHEEL

## THE PACKAGING PUZZLE, SOLVED

## Two energy systems, one Ducati-proportioned frame — mass kept central because the engine is decoupled.

The render depicts the actual architecture, not a generic e-moto. Each callout is a real packaging decision from the engineering read.

### A • BATTERY PACK

The densest mass (~90–110 kg) sits central, in the main frame triangle — exactly where a Ducati's engine visually lives. Preserves the mass centroid and the Ducati read at once.

### B • TRACTION MOTOR

Axial-flux, ~94 mm long — a compact disc tucked at the swingarm pivot. Short axial length means minimal rear overhang.

### C • RANGE-EXTENDER GENSET

Small single-cyl + generator (~35–55 kg), low and central-rear, below and behind the battery. A compact genset with a heavy-duty desert air filter — not a big engine.

CONCEPT FORM — LOCKED. DUCATI TRELLIS LANGUAGE ON RALLY-RAID PROPORTIONS. *BELOW: THE ELECTRIC HEART AND THE RANGE-EXTENDER, IN DETAIL.*

### THE STANCE, READ AS NUMBERS

A tall, long, wide-footed rally machine — not a low sportbike given knobbies. The proportions are the desert physics; the trellis and the tank-to-tail line are the Ducati read laid over them.

300–350

MM GROUND  
CLEARANCE

48 mm

USD FORK

1,550–

1,600

MM WHEELBASE

Piggyback

REMOTE-  
RESERVOIR SHOCK

910–960

MM SEAT HEIGHT

21" / 18"

SPOKED, WIDE  
REAR

~300 /

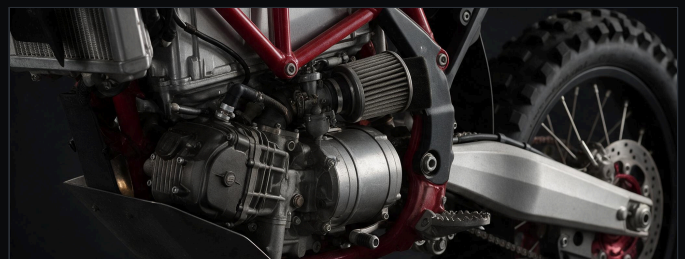
290

MM TRAVEL F / R

Trellis

STEEL, FIELD-  
REPAIRABLE

THE ELECTRIC HEART. BATTERY IN THE MAIN TRIANGLE; SIX ORANGE HV CABLES INTO THE MOTOR AT THE PIVOT.



THE RANGE-EXTENDER. SMALL SINGLE-CYL + GENERATOR, OWN DESERT AIR FILTER — IT TOPS UP THE BATTERY.

# Every block is a real, sourced part — or a proven part-class.

The powertrain is not where the risk lives. Continuous power in the desert matters more than peak – the number an insider actually interrogates.

## Traction motor

Design target: ~80–110 kW peak, with ~110–130 kW the class ceiling you would ever want on two wheels in sand. The recommendation is an **EMRAX axial-flux PMSM** – over-spec on peak, which is exactly why it is safe: it runs a bike’s duty cycle deep inside its continuous envelope, where the liquid-cooled variant gives real sealed-against-dust ingress protection.

### EMRAX 268 — OWNER’S DATASHEET V1.5

|                 |              |
|-----------------|--------------|
| Peak power      | 210 kW       |
| Continuous (S1) | 94–117 kW    |
| Peak torque     | 500 Nm       |
| Weight          | 21.4–22.3 kg |
| Cooling         | liquid, IP66 |
| Peak efficiency | up to 96%    |

**Lighter alternative:** the EMRAX 228 (12.2 kg, 100 kW peak, IP65) is arguably the right motor for a lightweight prototype; the 268 is the safe-headroom choice. Both are real, orderable EMRAX parts. The axial-flux “pancake” (~94 mm long) tucks against the swingarm pivot – aiding the mass centralization that reads Ducati.

## Traction inverter

The inverter delivers the sand-torque-control advantage, so it is spec’d to the motor’s current, not guessed. A **Cascadia Motion PM-class** unit – 450 A continuous, 600 A peak, 300–800 VDC, explicitly HEV/off-road-rated – drives an EMRAX 228/268 with margin. The exact model is a purchasing detail to confirm at BOM lock; the part *class* is proven and off-road-rated.

## Battery pack — sizing thinking

The pack is the primary energy store for dynamics and the thermal buffer; the fuel carries the range energy. So it is sized by *power and thermal need plus a useful electric range* – not by the 200-mile figure. A ~50 mi (80 km) electric range at ~90–130 Wh/km in sand puts usable energy near 7–10.5 kWh; headroom for peak power, regen and desert heat lifts the recommendation to a **~14–18 kWh, ~350–400 V pack**.

### CELL SELECTION — THE POWER-VS-ENERGY CALL

| CELL                               | WH/KG | MAX CONT. |
|------------------------------------|-------|-----------|
| Molicel P42A<br>the recommendation | 216   | 45 A      |
| Molicel P45B                       | 231   | 45 A      |
| LG M50LT<br>high-energy contrast   | 270   | 14.4 A    |

An 80–110 kW pull from a ~15 kWh pack is a high-C event. The high-energy M50LT’s 14.4 A limit would force a large parallel count – a bigger, heavier pack than the energy requires. The **Molicel P42A / P45B** (45 A each) takes the power and regen without a thermal panic, at ~15% lower energy density. The standard motorsport-EV choice, and the defensible answer to “why not the high-energy cell.”

### RIDE-BY-WIRE IS SIMPLER HERE

There is no throttle butterfly to actuate – the “throttle” is a torque request to the inverter. The twist-grip is a position sensor; the VCU maps it to a torque command with a rider-mode and traction layer on top. Proven, off-the-shelf motorcycle technology for a decade.

# A rally-raid chassis wearing trellis clothing.

Every suspension component is a real, orderable WP / KYB / Showa / Öhlins part at proven rally travel numbers. The engineering work is the bespoke frame.

## The frame

A **steel trellis** – the literal Ducati signature – re-proportioned for desert geometry. The trellis is not just an aesthetic borrow; it is the right structure here. It gives the visual Ducati read. It is *field-repairable* – a welded steel trellis can be fixed in a Baja pit with a welder, where a cast beam or carbon monocoque cannot. And it packages the hybrid mass well: the battery sits in the main triangle where a Ducati’s engine would be, preserving the mass centralization, while the genset tucks lower and rearward.

### THE SINGLE MOST IMPORTANT INSTRUCTION

Do not draw a low sportbike stance. The magic is Ducati *language* on rally-raid *proportions* – a tall, long, wide-footed machine with a trellis frame and Ducati bodywork.

Swingarm: a long aluminium unit; a single-sided swingarm is available as a Ducati styling cue if the rear packaging (motor + genset) allows the width – a design-vs-mass decision, not an engineering blocker.

### GEOMETRY RE-MAP – SPORTBIKE → DESERT

|                  |                        |
|------------------|------------------------|
| Wheelbase        | 1,440 → 1,550–1,600 mm |
| Rake             | ~24° → 26–28°          |
| Ground clearance | ~130 → 300–350 mm      |
| Seat height      | → 910–960 mm           |
| Wheels           | spoked 21" F / 18" R   |

### SUSPENSION TRAVEL – GROUNDED REFERENCE POINTS

| REFERENCE MACHINE                                       | FRONT   | REAR    |
|---------------------------------------------------------|---------|---------|
| KTM 450 Rally Replica<br>WP XACT PRO                    | 304 mm  | 280 mm  |
| KTM 890 Adv R Rally<br>WP XPLOR PRO                     | 270 mm  | 270 mm  |
| Kove 800 X Rally<br>YU-AN / piggyback                   | 270 mm  | ~250 mm |
| <b>The Baja Ducati</b><br>target – full rally-raid spec | ~300 mm | ~290 mm |

Target: a 48 mm closed-cartridge USD fork and a piggyback / remote-reservoir rear shock. **The remote reservoir is not optional in the desert** – sustained high-speed damping in heat dumps enormous energy into the oil, and a remote reservoir keeps the damping fluid from fading. It is why every reference bike runs one. Suppliers: WP (the credibility pick), KYB, Showa, Öhlins.

## WHEELS, TYRES & FLOTATION

### SPOKED, NOT CAST

21" front / 18" rear spoked rims flex and survive impacts that would crack a cast wheel – and they are field-serviceable. The rally-raid standard.

### FLOTATION IS PRESSURE

Soft-sand float is a tyre-pressure and footprint strategy: a knobby rally tyre run low, with a mousse or heavy-duty tubes, and a wider rear than a sportbike. A tuning item, not a risk.

### FIELD-REPAIRABLE BY DESIGN

The chassis philosophy end to end: a welded steel trellis, spoked wheels, serviceable seals. What breaks in the desert can be fixed in the desert – a real race argument, not a rationalization.

# The difference between a concept and a machine that survives a real Baja day.

40–50 °C ambient, sub-100-µm abrasive dust, and a stationary machine in the sun as the worst cooling case.



IN ITS ELEMENT. WIND-TUNNEL CREDIBILITY · REAL LIGHT — THE BODYWORK CELEBRATES ITS COOLING AIR PATHS RATHER THAN HIDING THEM.

## SAND INGRESS — HARD

Sub-100-µm abrasive dust destroys seals, connectors, bearings, and clogs air paths. The genset intake is the one unavoidable open breathing path.

**Mitigation:** IP66/67 sealed motor, pack and connectors throughout; labyrinth + lip seals on all rotating joints; a multi-stage desert air filter on the intake; pressure-equalization membranes on sealed boxes. *Residual:* filters and seals are desert consumables — the machine must be designed for fast field service of them.

## THERMAL IN HEAT — HARD

Sustained high-power draw at 45–50 °C is the worst thermal case; the worst cooling case is a stationary machine in the sun. Under-cool it and the pack derates.

**Mitigation:** dual liquid loops (LT for pack/electronics, HT for the ICE), radiators sized to the still-air high-ambient worst case, high-power cells that run cooler, BMS derate as the safety net. *Residual:* an honest performance derate at the thermal extreme — stated as a spec, not hidden.

## COOLING AIRFLOW VS. TIGHT BODYWORK

Two radiators plus fans need clean front-facing airflow — a real tension with tight Ducati bodywork. Radiators must not be blanked. The answer is bodywork with genuine air paths, designed as a feature to celebrate, not hide. This is the wind-tunnel credibility the renders must carry.

## FLOTATION OVER SOFT SAND

Soft-sand flotation is a tyre-pressure and footprint strategy: a knobby rally tyre at low pressure with heavy-duty tubes or a mousse, and a wider rear than a sportbike for float. A tuning and spec item, not an engineering risk — but the reason the machine wears a wide desert rear, not a tight sportbike one.

**The honest desert posture:** *known fixes, held to a spec, with the residual risk named — a maintenance interval and a bounded thermal derate — rather than a claim that sand and 50 °C heat have been made to disappear.*

|                    |                             |
|--------------------|-----------------------------|
| Ingress target     | IP66 / IP67 throughout      |
| Worst thermal case | 45–50 °C, stationary, sun   |
| Cooling            | Dual liquid loops (LT + HT) |
| Consumables        | Field-serviceable by design |

# Named suppliers, honest lead times, the schedule drivers flagged.

Lead times are engineering-planning estimates by part nature (COTS vs bespoke), not vendor-quoted dates. Confirm each with a written quote at BOM lock.

- COTS
- BESPOKE
- SCHEDULE DRIVER

| SUBSYSTEM                                        | NAMED SUPPLIER(S)                  | PART / CLASS                          | SOURCING             | LEAD TIME   |
|--------------------------------------------------|------------------------------------|---------------------------------------|----------------------|-------------|
| Traction motor                                   | EMRAX (SI); alt. YASA (UK)         | 228 / 268, liquid-cooled IP65/66      | COTS, made-to-order  | ~10–20 wk   |
| Inverter                                         | Cascadia Motion (US) / RMS         | PM/HD-class, HEV/off-road             | COTS                 | ~8–16 wk    |
| Battery cells                                    | Molicel (TW)                       | INR-21700-P42A / P45B                 | COTS commodity       | ~4–12 wk    |
| Battery pack                                     | bespoke integrator                 | 14–18 kWh, sealed IP67, liquid-cooled | BESPOKE              | ~16–28 wk   |
| Suspension                                       | WP (AT); alt. KYB, Showa, Öhlins   | ~300 mm rally fork + piggyback shock  | COTS racing          | ~8–16 wk    |
| Frame                                            | bespoke fabricator                 | steel trellis, rally geometry         | BESPOKE              | ~12–24 wk   |
| Range-extender genset<br>the hardest integration | bespoke (engine + PM generator)    | ~15–25 kW ICE + PM gen + controller   | BESPOKE              | ~20–36 wk   |
| Ride-by-wire                                     | Bosch / Magneti Marelli class      | ETB + twist-grip sensor + VCU         | COTS moto            | ~6–12 wk    |
| Stability / TC ECU                               | Bosch MSC class + calibration      | IMU + control + desert calibration    | COTS HW / bespoke SW | HW ~6–12 wk |
| Wheels / tyres                                   | spoked 21/18 + rally tyre + mousse | COTS rally-raid                       | COTS                 | ~4–8 wk     |
| Connectors / seals                               | Amphenol / TE Deutsch class        | IP67 HV + signal                      | COTS                 | ~4–8 wk     |

The three schedule drivers are the same three subsystems the hard-parts section names as hard: the frame, the battery pack, and the range-extender genset. The hard engineering, the expensive engineering, and the slow engineering are one list.

**BUILD THE SCHEDULE BACKWARD**

Everything else buys in parallel. Build the timeline backward from the genset (~20–36 wk) as the long pole – and remember the three drivers *interlock*, they do not simply run in parallel.

09

# An insider reads a feasibility document to find the glossed risk. There isn't one.

Each risk is real, each has an honest mitigation, and each names its residual. “Here is the risk and here is the mitigation” is the credibility posture.

## Hybrid packaging vs. Ducati mass centralization

HARD — THE DEFINING PROBLEM

**Risk:** a Ducati reads as Ducati because its mass is tucked tight and central. This machine carries *two* energy systems – a ~15–18 kWh battery *and* an ICE + generator + fuel tank + two cooling loops. Naively packaged, the mass sprawls, the polar moment balloons, and it handles like a loaded mule.

**Mitigation – why series-hybrid earns its keep:** because the ICE is decoupled, packaging is a *free optimization*. Battery central in the main triangle; genset low and central-rear; fuel near the mass centroid so balance barely shifts full-to-empty; axial-flux motor at the pivot. **Residual:** a genuine 3D packaging puzzle, the prototype's hardest design task – solvable *because* of the decoupling, but real work.

## RANGE-EXTENDER GENSET

HARD — LONG POLE

**Risk:** no off-the-shelf ~15–25 kW motorcycle-scale genset exists. **Mitigation:** a proven single-cyl EFI engine run at a fixed efficient RPM, coupled to a PM generator (the same EMRAX/YASA machines are rated for generation), with a rectifier and BSFC-hold controller. **Residual:** the single most bespoke subsystem – an integration job, priced and scheduled as one.

## WEIGHT BUDGET

HARD

**Risk:** rally bikes target ~150–165 kg dry; this machine carries a battery *and* a genset *and* fuel. **Mitigation:** size the pack to the dynamic need, not oversized for range – the fuel carries range; high-power cells let a smaller pack deliver the power. **Residual:** a realistic all-up prototype is **~200–240 kg wet**. Own the number – an insider who does the mass math will respect the honesty and distrust a claimed 170 kg.

## SAND + THERMAL, AT ONCE

HARD

**Risk:** desert sealing and desert cooling are both unforgiving, and must be done together – a single miss on either strands the machine. **Mitigation:** IP66/67 throughout, multi-stage intake filtration, dual liquid loops sized to the still-air worst case, BMS derate as the net. **Residual:** known fixes, unforgiving of any single miss – detailed in §05.

## DESERT TC CALIBRATION

MODERATE

**Risk:** off-the-shelf TC prevents wheelspin on tarmac; sand *needs* controlled wheelspin. Wrong calibration makes the bike worse than a cable throttle. **Mitigation:** the hardware is proven; the desert slip-target calibration is bespoke software. **Residual:** development, not invention – and the e-motor's fine torque control is what makes a good desert calibration *possible*. One of the strongest “why electric” arguments in the pitch.

The hard parts, the expensive parts, and the slow parts are one list. Frame, battery pack, genset – and that is not a coincidence. It is what a first-of-kind integration always looks like.

08 / THE HONEST PROTOTYPE COST BAND

# A running prototype costs on the order of €350k–€800k — and the cost is NRE-dominated.

The honest planning centre – the number to raise against – is ~€500k–€600k for one demonstrable, desert-tested machine. The band is wide on purpose; the width is the story.

| THE COST BAND – THREE BUCKETS                                  |               |               |
|----------------------------------------------------------------|---------------|---------------|
| BUCKET                                                         | LOW           | HIGH          |
| Components<br>hardware on the machine                          | ~€51k         | ~€105k        |
| NRE, integration & test<br>the engineering that makes it exist | ~€290k        | ~€690k        |
| <b>Total prototype</b><br>one running, desert-tested machine   | <b>~€341k</b> | <b>~€795k</b> |

The parts bolted to this machine total ~€51k–€105k. The engineering that turns those parts into a first-of-kind, two-energy-system desert motorcycle totals ~€290k–€690k. **The engineering is five to six times the hardware.** An insider expects exactly this shape and distrusts a pitch that quotes a €60k BOM as if it were the prototype.

**PROTOTYPE ≠ PRODUCTION**

At volume, the frame NRE amortizes to near zero per unit, the pack becomes a repeatable assembly, the genset a productized module, and component cost dominates. A production unit cost is a different, much smaller number – and a later question. This document is about the one machine that proves the thesis is real.

**THE THREE COST DRIVERS**

Genset integration

€60–140k

LONGEST POLE · NO OFF-THE-SHELF UNIT

Battery-pack engineering

€50–120k

BESPOKE SEALED, LIQUID-COOLED PACK

Frame engineering

€40–90k

DESIGN + ONE-OFF JIG & TOOLING

**THE NO-DOUBLE-COUNTING RULE**

The pack, genset and frame appear twice on purpose – once as *hardware* (the tube, the cells) and once as *NRE* (the design, the jig, the BMS tuning, the controller). Adding them is correct; conflating them is the error. The workbook keeps them on separate sheets for exactly this reason.

**WHY THE BAND IS WIDE – AND WHY THAT IS A CREDIBILITY SIGNAL**

The spread is the honest distance between a **lean build** (an existing engine platform, a used EMRAX, a tight test program) and a **fuller build** (more genset-integration iteration, a more instrumented desert campaign, a healthy contingency). A first-of-kind hybrid prototype lands somewhere inside – depending on how much genset and pack work runs in-house versus contracted, and how many desert iterations the calibration needs. Pretending to one tidy figure is what an insider would catch.

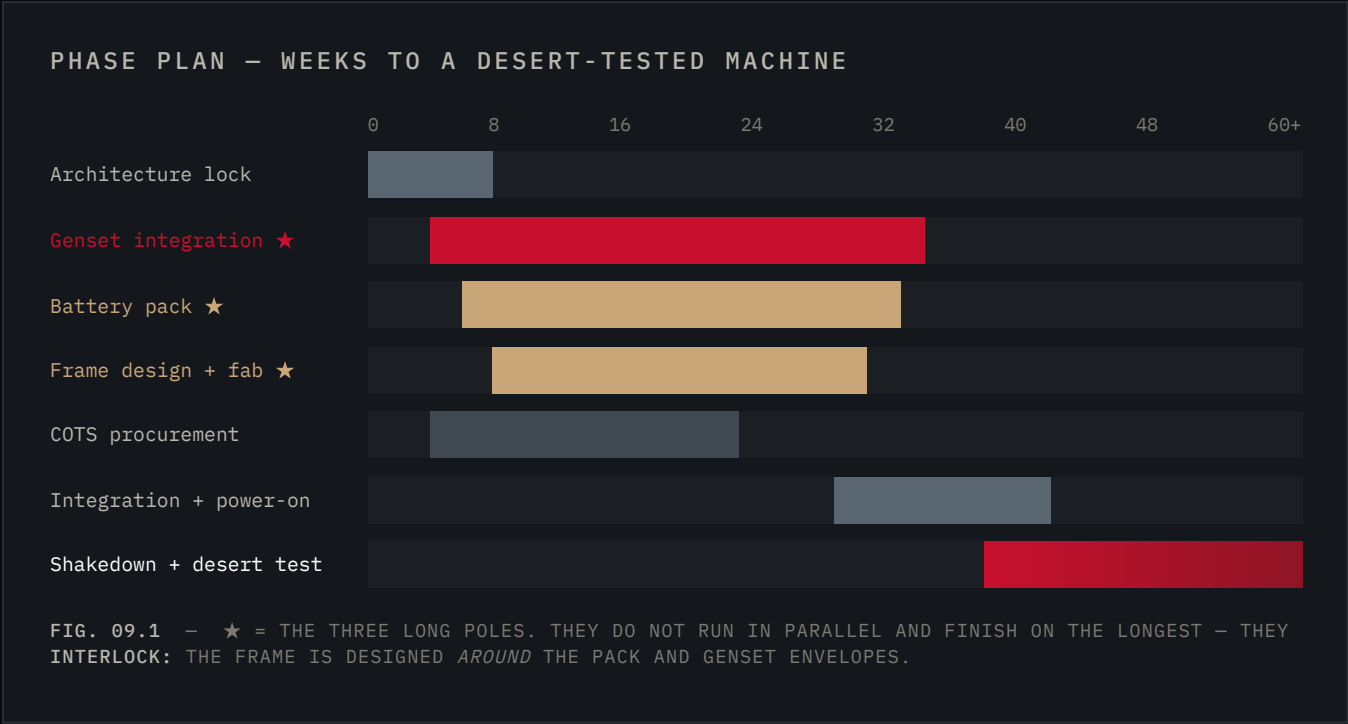
08 - PROTOTYPE COST BAND

|                 |                                  |
|-----------------|----------------------------------|
| Components      | ~5× less than NRE                |
| Planning centre | ~€500k–€600k                     |
| Collapses at    | BOM lock (written quotes / SOWs) |

09 / DEVELOPMENT TIMELINE

# ~14–20 months to a running, desert-tested prototype.

Built backward from the genset pole and the co-design interlock – not from any single part’s ship date. No fantasy schedule.



## PHASE 0 • WK 0–8

Freeze architecture, pack and genset sizing. Kick off the frame ↔ pack ↔ genset co-design *simultaneously* – the single most important scheduling move. Place the genset and battery contracts first; order long-lead COTS now.

## PHASE 1-2 • WK 4–44

The three long poles run concurrently but interlocked; the genset is bench-tested to a stable BSFC-hold before it enters the frame. Then rolling chassis, powertrain install, two cooling loops, sealed harness, first HV power-on, first wheel under power.

## PHASE 3 • WK 40–60+

Shakedown, then the desert work: TC slip-target calibration (it iterates), thermal validation at 45–50 °C, sand-ingress validation, range and genset-endurance runs. **The machine is “done” when it has completed a real desert test day** – not when it first turns a wheel.

# ~14–20

MONTHS, ARCHITECTURE LOCK TO DESERT-TESTED MACHINE

A build that contracts more of the genset and pack work to established partners lands nearer **14 months**; a leaner in-house build with more iteration lands nearer **20**. Either way, the driver is the genset pole and the co-design interlock – not any single ship date. That is the honest schedule, and it is the one an insider can pressure-test against the parts.

# Buildable — with caveats. The risk is execution, not physics.

● FUNDABLE RISK PROFILE

Every subsystem is real hardware from a real supplier, or a proven part-class, today. Nothing on this machine requires an invention. It is buildable by a competent small engineering team with a good fabricator, a battery integrator, and a genset integration partner. The caveats are honest and specific, not deal-breakers.

## THE FIVE CAVEATS, OWNED

- 1 • The range-extender genset is a bespoke integration — no off-the-shelf unit. Longest lead pole.
- 2 • Packaging two energy systems into one Ducati-proportioned machine is the defining design task — solvable because series-hybrid decouples the ICE.
- 3 • The weight lands ~200–240 kg wet, heavier than a pure rally bike. Own the number.
- 4 • Desert sealing and thermal must be done at once — known fixes, unforgiving of any single miss.
- 5 • Desert TC calibration is development work, not invention.

**The fundable risk:** *the risk is “can this team execute a hard integration” — which capital and a good team retire — not “does the physics work,” which they cannot. The prototype raise buys the answer to the only open question.*

## CRITICAL PATH — LONGEST-LEAD, IN ORDER

- 1 **Genset integration**  
~20–36 wk. Start first — the long pole and the most bespoke.
- 2 **Frame design + fab**  
~12–24 wk. Gates the rolling chassis; every packaging decision flows through it.
- 3 **Battery pack**  
~16–28 wk. Bespoke — and it defines the mass centroid the frame is built around.

## THE HONEST DRIVER

These three interlock — the frame is designed around the pack and genset. The real driver is frame → pack → genset co-design, not any single ship date.

## TRUTH STANDARD & SOURCES

Every load-bearing spec, supplier and lead time traces to a source fetched 24 September 2026 — EMRAX (268 datasheet v1.5, 228), YASA 750R, Cascadia Motion PM-class inverter, Molicel P42A/P45B and LG M50LT cells, WP / KYB / Showa / Öhlins suspension, KTM / Kove rally-geometry references, MAHLE / Brogen / Horse range-extender context — or is written as an honest range with its basis named. All sizing, weight, lead-time and cost figures are engineering-effort and planning estimates, marked as such; each collapses to a point at a written quote or SOW at BOM lock, not before.

## COMPANION WORKBOOK

The live BOM — prototype-bom.xlsx — ships alongside this dossier; change an input and the totals move. **Note:** a few long-text cells display truncated in the workbook; the full narrative lives in this dossier, and the cell values themselves are complete.