

One plant, two tariffs, and what changes when you can see inside the panel

A simulated mid-size auto-component plant, modelled minute by minute for two months and priced under Maharashtra's and Karnataka's industrial tariffs for 2026-27. We run it twice: once with only the monthly bill to go on, and once with Metrion reading every feeder and Kairon pricing it. Same plant, same problems. The difference is when someone finds out, and what that is worth in each state.

Simulated plant. The factory and its loads are synthetic, built from typical load behaviour for each machine type. The tariff rules are real and cited to the page of each order. This case study shows a method. It is not a customer result, and it makes no claim about meter accuracy, which we will publish only after bench calibration.

1. The plant

A fictional auto-component plant in a Pune-area MIDC estate, on a single HT industrial connection with a contract demand of **540 kVA**. It runs injection moulding, CNC machining and a tempering oven. In October it works two shifts, six days a week. In November orders slow: one shift, two press lines stood down, and one week in which motors are left idling.

FEEDER	LOAD	HOW IT BEHAVES IN THE MODEL
F2	4 hydraulic presses (fixed-speed pumps)	Cycling ~32 kW each at PF 0.80; idling ~10 kW at PF 0.40
F3	1 servo press	~22 kW cycling at PF 0.95
F4	CNC bay, 6 machines on drives	Spiky, ~9 kW average each, PF 0.93
F5	Air compressor, fixed-speed	55 kW loaded (PF 0.87); 18 kW unloaded (PF 0.35)
F6	Chiller / cooling tower	~38 kW, higher in the afternoon, PF 0.86
F7	Tempering oven, resistive	110 kW pre-heat 05:00–06:45, then thermostat cycling
F8	Lighting, HVAC, offices	35 kW by day, 12 kW at night
APFC	Capacitor panel, 6 × 25 kvar	Switches steps to hold the incomer near PF 0.98

Three things go wrong, as they do in real plants. On **14 October**, the oven is switched off over lunch to save power and re-heated at full power at 12:00, the same moment the presses restart and the compressor refills. On **15 October**, the fuse feeding five of the six capacitor steps blows, and nobody notices. In the week of **16–21 November**, presses and the compressor are left running unloaded.

The model runs at one-minute resolution for 61 days (87,840 minutes per feeder), with a fixed random seed so every figure in this document is reproducible.

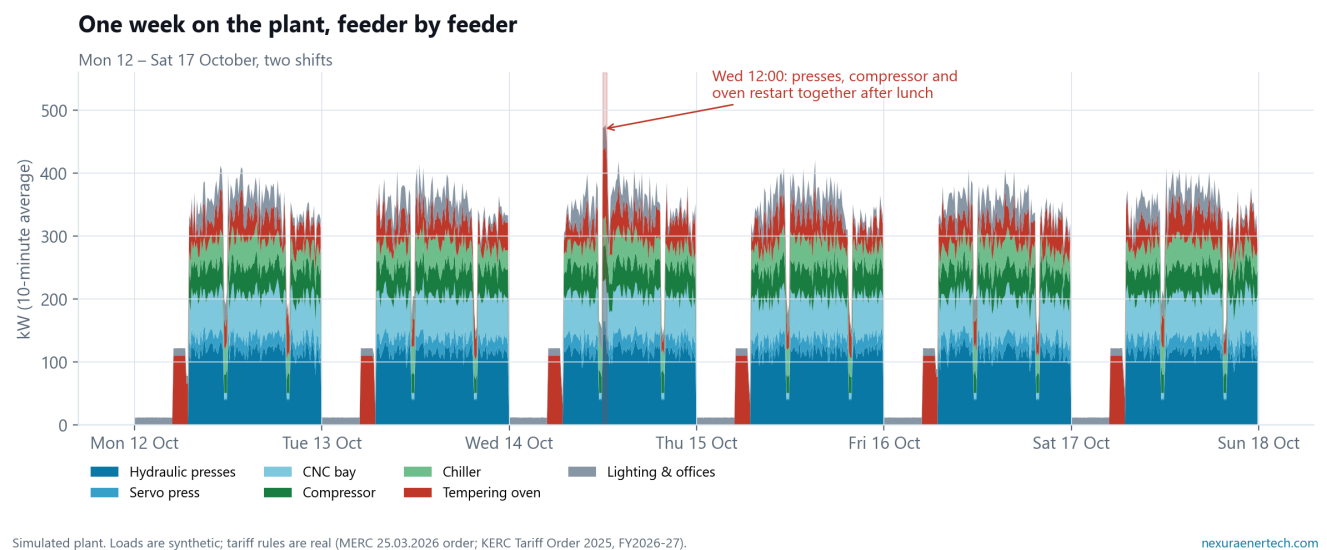


Figure 1. One week of load by feeder. The red band is the lunchtime restart on Wednesday 14 October.

2. From minutes to the demand charge

Both states bill industry on **maximum demand**, the highest average kVA in any 30-minute block of the month, but each puts a floor under it. In Maharashtra billing demand is the higher of recorded maximum demand (counted from 06:00 to 24:00) or **75%** of contract demand. In Karnataka it is the higher of maximum demand or **90%** of contract demand.

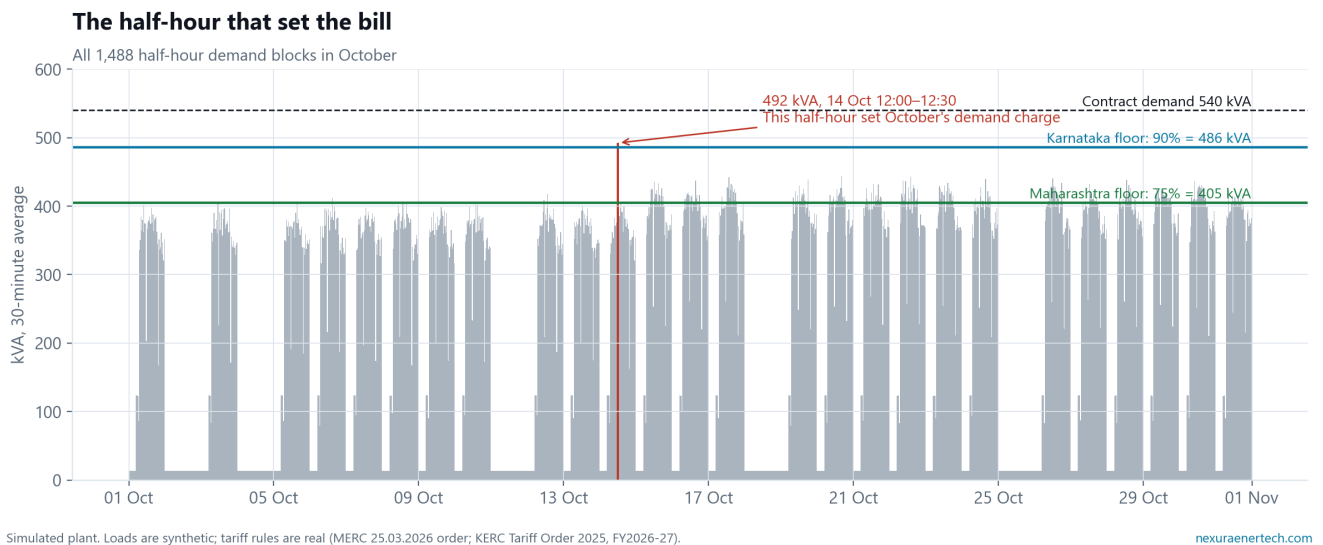


Figure 2. All 1,488 half-hour blocks in October. One block, 12:00–12:30 on 14 October, set the month's demand at 492 kVA.

What the chart shows. On every other day the plant peaks around 400–440 kVA. One badly timed restart produced a half-hour about 50 kVA above any other in the month, and that half-hour is what the whole month's demand charge is billed on. Notice also that every block after 15 October sits about 30 kVA higher: the missing capacitors push kVA up for the same kW.

November is the opposite case. Recorded demand peaks at only 375 kVA, below **both** floors. The plant pays on 405 kVA in Maharashtra and 486 kVA in Karnataka: capacity it did not use.

3. Power factor

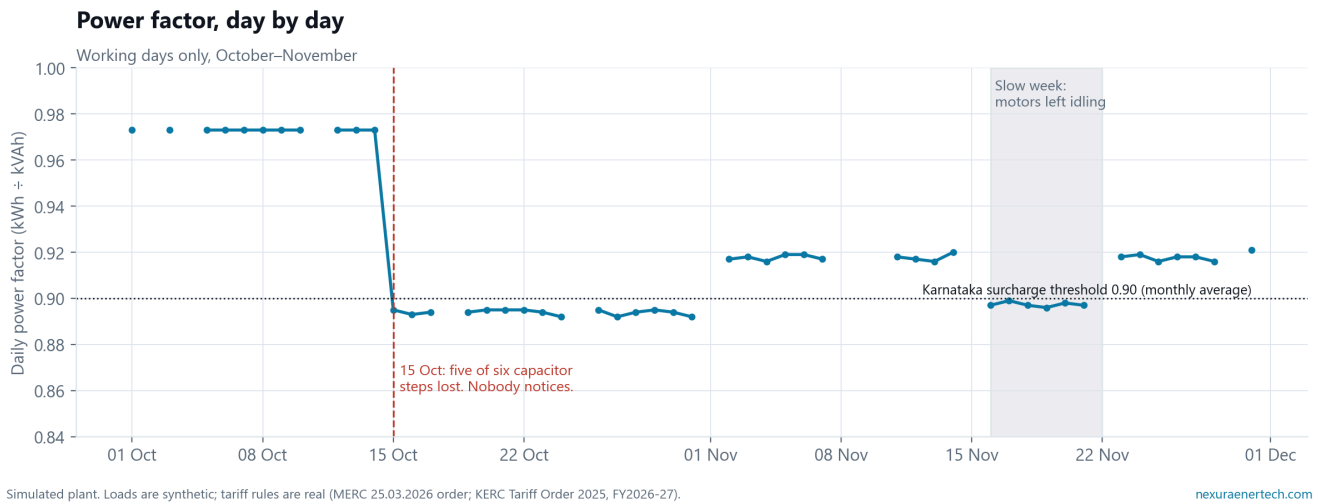


Figure 3. Daily power factor. The capacitor failure on 15 October drops it from 0.97 to about 0.89, and it stays there.

The two states treat this very differently. Maharashtra bills HT industry in **kVAh**, so a lower power factor raises the billed units every day it lasts. Karnataka bills in kWh and levies a surcharge only when the **monthly average** power factor falls below 0.90. Here the monthly average stayed at 0.93 in October and 0.91 in November, so Karnataka charged nothing extra. Same fault, same plant: a real cost in one state, invisible on the bill in the other, until a worse month tips the average below 0.90.

4. The bill, line by line

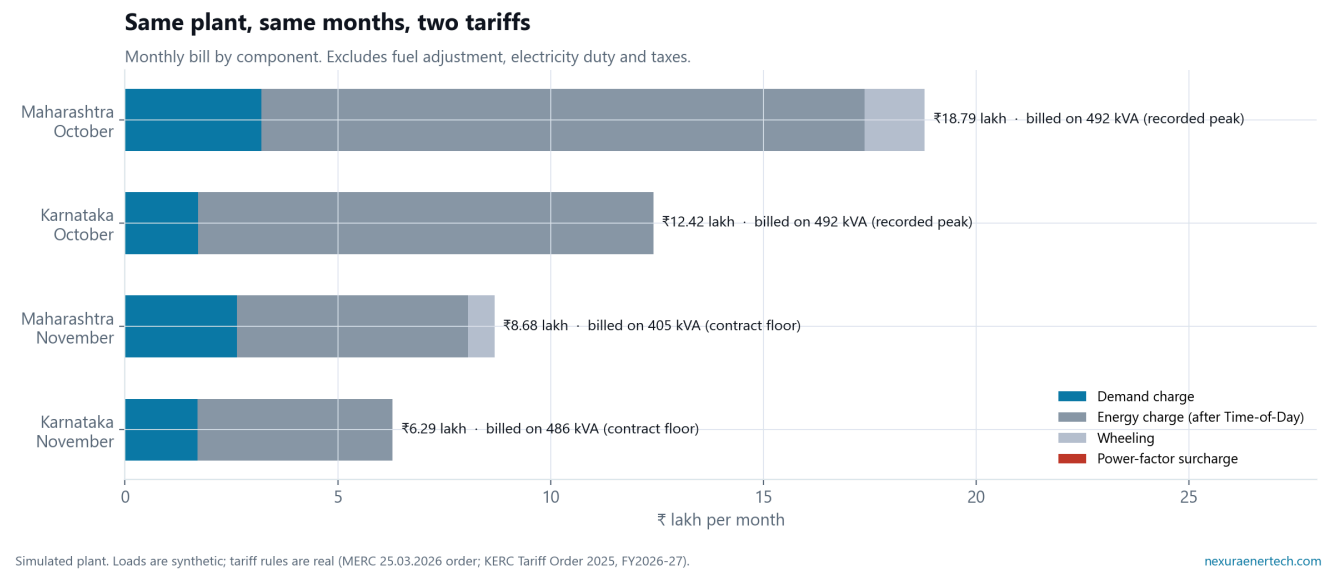


Figure 4. Monthly bill by component. Fuel adjustment, electricity duty and taxes are excluded in both states, so the totals are not a verdict on which state is cheaper.

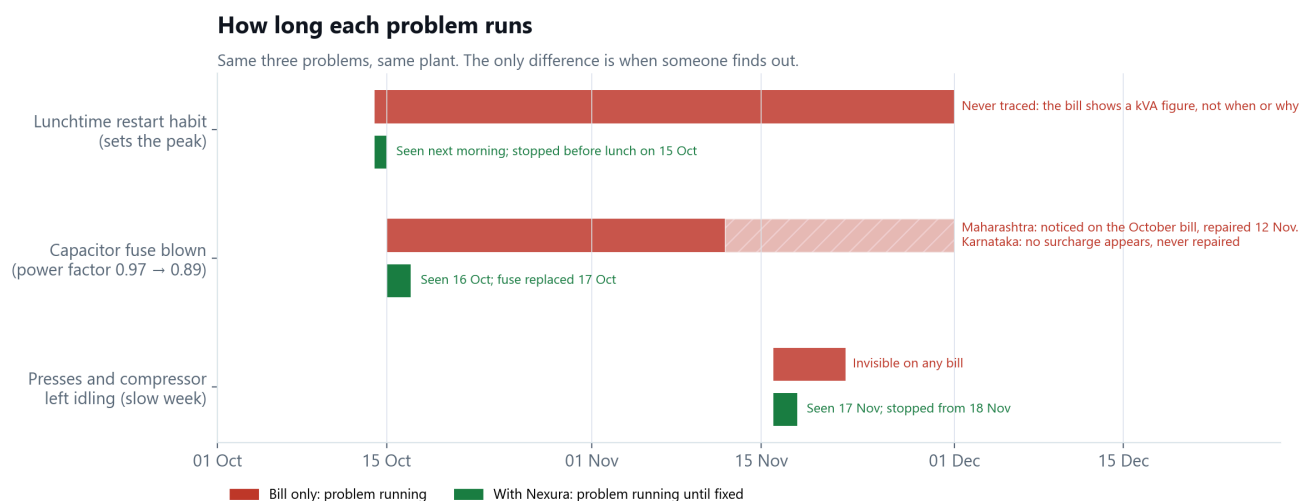
	MAHARASHTRA OCT	KARNATAKA OCT	MAHARASHTRA NOV	KARNATAKA NOV
Recorded maximum demand	492 kVA	492 kVA	375 kVA	375 kVA
Billing demand	492 (peak)	492 (peak)	405 (floor)	486 (floor)
Demand charge	₹3,19,957	₹1,72,284	₹2,63,250	₹1,70,100
Energy charge, after Time-of-Day	₹14,17,186	₹10,69,688	₹5,43,045	₹4,58,586
of which Time-of-Day effect	-₹60,773	₹0	-₹99,620	₹0
Wheeling	₹1,41,842	—	₹61,678	—
Power-factor surcharge	—	₹0	—	₹0
Total (excl. FAC, duty, taxes)	₹18,78,984	₹12,41,972	₹8,67,973	₹6,28,686

Units: October 1,62,074 kWh and 1,75,114 kVAh; November 69,483 kWh and 76,145 kVAh. Maharashtra bills energy in kVAh, Karnataka in kWh. Karnataka's Time-of-Day schedule applies to this plant (contract demand above 500 kVA), but every slot is zero from July to November, so it has no effect in these two months.

5. Where Nexura comes in

So far the plant has been described from the outside, the way its owner sees it: one bill a month. Now we run the same two months again in two worlds.

- **Bill only.** The owner learns about problems from the bill. In this world the lunchtime "save power" habit that began on 14 October carries on, because the bill shows a kVA figure but not when it happened or why. In Maharashtra the October bill, arriving in early November, prints a lower power factor; the owner has the capacitor panel checked and it is repaired on 12 November. In Karnataka no surcharge appears, so nothing prompts a repair.
- **With Nexura.** Metrion reads every feeder inside the panel, and Kairon prices the readings against the plant's own tariff. Every morning our team reviews that analysis and emails the plant a short daily review of what it shows, alongside the dashboard and weekly, monthly and quarterly reports. The plant decides what to do; Kairon recommends and never switches anything.



Simulated plant. "With Nexura": Metrion readings reviewed each morning by our team during a pilot; the plant decides and acts.

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Figure 5. How long each problem runs in each world.

WHAT HAPPENED	WHAT THE READINGS SHOWED, AND WHEN	WHAT THE PLANT DID	VALUE, MAHARASHTRA	VALUE, KARNATAKA
14 Oct: oven, presses and compressor restart together after lunch	Next morning: a new month-high half-hour, 12:00–12:30, with the three feeders that caused it	Stopped switching the oven off at lunch; staggered restarts from 15 Oct	₹53,392	₹22,181
15 Oct: capacitor fuse blows	16 Oct: incomer power factor down from 0.97 to 0.89 overnight, reactive power up, with no change in production	Fuse replaced 17 Oct	₹81,028	≈ ₹0
16 Nov: presses and compressor left running unloaded	17 Nov: hours of idle running on the press and compressor feeders	Machines stopped when idle, from 18 Nov	₹5,681	₹4,847
Two months together (the individual values overlap, so they add to more than this)			₹1,32,540	₹27,301

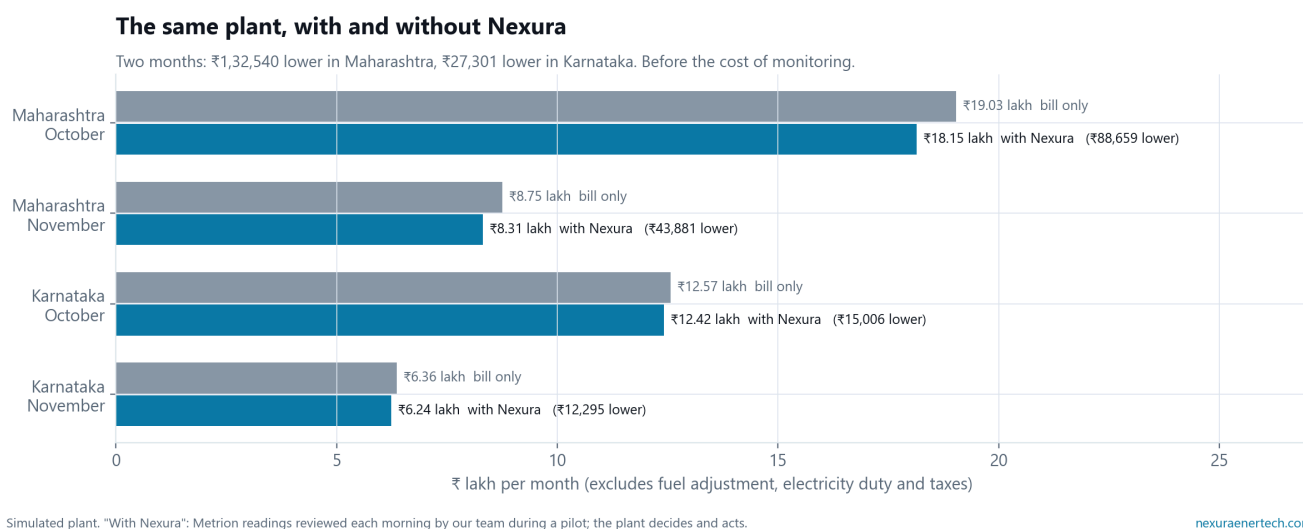


Figure 6. Monthly bill in each world. Before the cost of monitoring; fuel adjustment, electricity duty and taxes excluded.

Read this honestly. The 14 October half-hour still sets October's peak in both worlds: monitoring cannot undo a half-hour that has already happened. What it does is stop it happening again. Without it, the habit lifts October's peak to 522 kVA and November's to 438 kVA in the bill-only world; with it, they stay at 492 and 357 kVA. The capacitor is worth ₹81,028 in Maharashtra because kVAh billing charges for it every day, and almost nothing in Karnataka over these two months because the monthly average never crossed 0.90. In Karnataka the larger opportunity is the contract floor (Section 2), a decision that needs months of interval data to make safely.

6. What changes, and where it pays

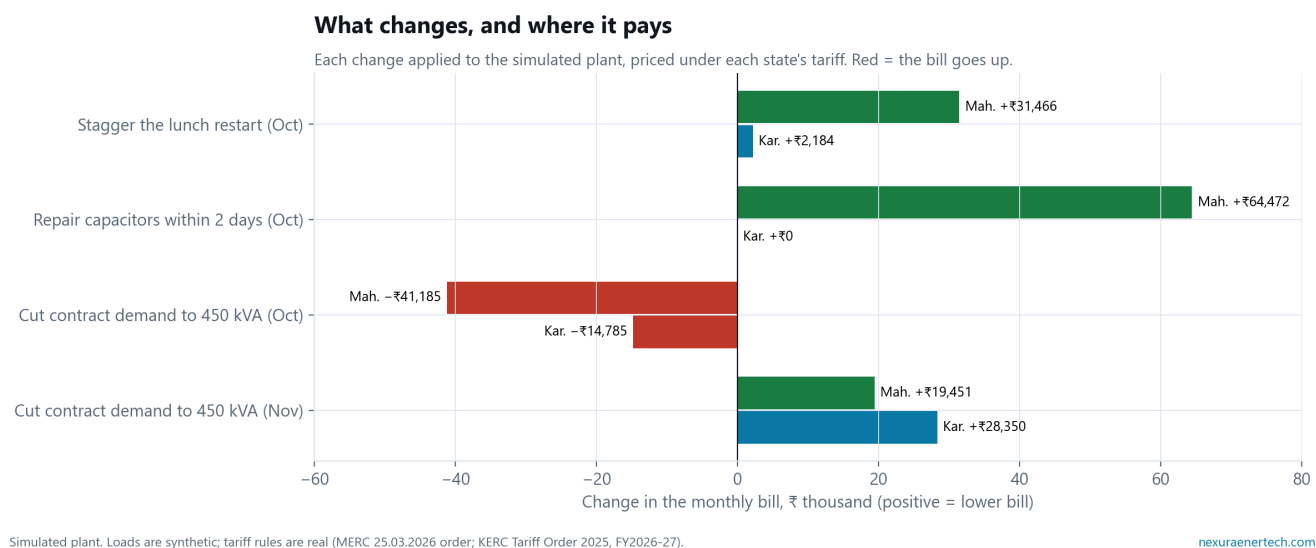


Figure 7. Each change applied to the simulated plant and re-priced. Green and blue lower the bill; red raises it.

- **Stagger the lunch restart.** Removing the coincident restart brings October's peak from 492 to 444 kVA. In Maharashtra that is worth ₹31,466. In Karnataka only ₹2,184, because the 90% floor (486 kVA) sits just below the peak, so most of the reduction disappears into the floor.
- **Repair the capacitors within two days.** Worth ₹64,472 in October in Maharashtra, through fewer billed kVAh. In Karnataka, ₹0 this month, because the monthly average never crossed 0.90.
- **Cut contract demand to 450 kVA.** Tempting after a quiet November: it saves ₹19,451 (Maharashtra) and ₹28,350 (Karnataka) that month. But October's 492 kVA would then exceed the contract by 42 kVA, and the excess penalty costs ₹41,185 in Maharashtra and ₹14,785 in Karnataka. Over the two months Maharashtra ends up ₹21,734 worse off, Karnataka ₹13,565 better off. A contract-demand change is only safe once you know what sets your peak.

The point. The same plant, the same events and the same fixes produce different rupee answers in two states, because the tariff rules differ. That is why our analytics hold each state's tariff as versioned data, cited to the order, rather than as one national rule of thumb.

7. Method and limits

How it was computed

- Each feeder's active and reactive power is generated minute by minute; the capacitor panel switches steps against the total; the incomer kVA is the vector sum, with about 1% internal losses.
- 30-minute demand blocks are averaged from the one-minute kVA, as a utility meter integrates over 30 minutes.
- Pricing is a pure function of the readings and a tariff definition held as data: rates, floors, Time-of-Day slots, counted window, power-factor rule and excess-demand rule.
- The bill-only and with-Nexura worlds use identical random draws, so every rupee of difference comes from when a problem was found and fixed, nothing else.
- "With Nexura" means our team reviewing Kairon's analysis of Metrion readings each morning and emailing the plant a daily review, as we do for every pilot and paying site. Automatic flags for these three patterns are on Kairon's roadmap; they are not claimed here as a shipped feature.

What this case study does not show

- **Meter accuracy.** No measured-versus-true comparison is included. Our bench calibration is not yet complete, and we will not publish an accuracy figure before it is.
- **A real plant or a real saving.** All loads are synthetic. The rupee figures, including the with-Nexura difference, are what the tariff rules produce for this simulated plant, not a forecast or promise for any business, and they are before the cost of monitoring.
- **The full bill.** Fuel adjustment charges, electricity duty, taxes, meter rent and prompt-payment rebates are excluded in both states.

Tariff sources (FY2026-27)

RULE	MAHARASHTRA (MSEDCL HT I(A) INDUSTRY)	KARNATAKA (HT-2(A) INDUSTRY)
Demand charge	₹650/kVA/month — MERC Case 75 of 2025 (post-remand), 25.03.2026, p.100	₹350/kVA/month — KERC Tariff Order 2025 (27.03.2025), Annexure 9, p.550
Billing demand	Higher of MD (06:00–24:00) or 75% of CD — MERC Case 217 of 2024, p.787; paras 7.28.6, 7.28.11	Higher of MD or 90% of CD — Annexure 9, HT billing cl.1(A), p.545; 30-minute MD, Conditions of Supply cl.2.38
Energy charge	₹8.44/kVAh + ₹0.81 wheeling — Case 75 order, p.100	660 paise/kWh — Annexure 9, p.550
Time-of-Day	Solar 09–17: $\times 0.75$ Oct–Mar ($\times 0.85$ Apr–Sep); peak 17–24: $\times 1.20$; on energy charge only — Case 75 order, Table 8, pp.76–77	Dec–Jun +100 paise (06–09, 18–22), –100 (22–06); every slot 0 Jul–Nov; compulsory at CD ≥ 500 kVA — Annexure 9, p.552; cl.26, p.527
Power factor	Priced through kVAh billing (HT since 1 Apr 2020) — Case 217, para 7.16.7	3 paise/unit per 0.01 below 0.90, monthly average, no cap stated — Annexure 9, cl.2, p.545
Excess over CD	Additional 150% of demand charge on the excess — Case 217, p.785	Excess at two times the normal rate — Annexure 9, cl.1(B), p.545

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