



BUILDING ENERGY + HVAC DIGITAL TWIN

OPEN SOURCE

Vendor-neutral thermal simulation, calibration, validation and control optimization, built with Vicena

MIT • Level 0 synthetic reference

Turn building telemetry into an inspectable, calibratable HVAC research workflow.

Validate time series, fit transparent physics, test held-out periods, quantify uncertainty, then optimize cost against comfort constraints.

THERMAL BASELINE

1R1C envelope • gains • zone temperature
Heating + cooling loads

ENERGY + COMFORT

COP • fan • base power • tariffs
Occupied comfort degree-hours

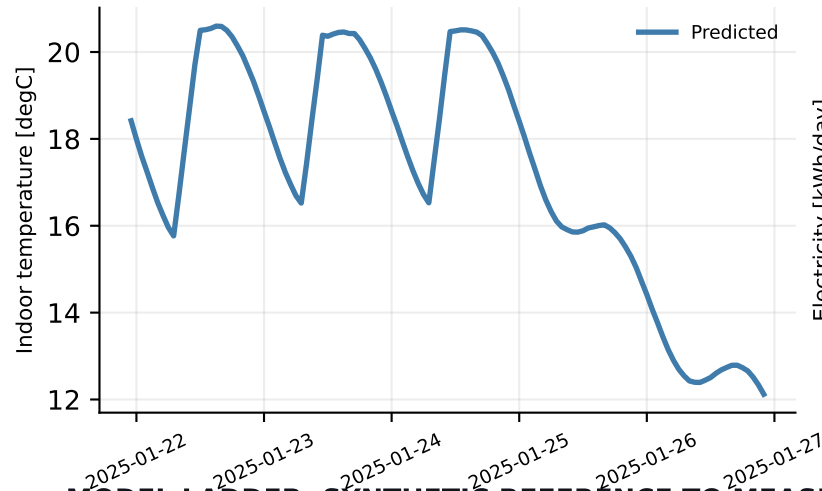
CALIBRATION + VALIDATION

Chronological split • residuals
Local uncertainty • analytical check

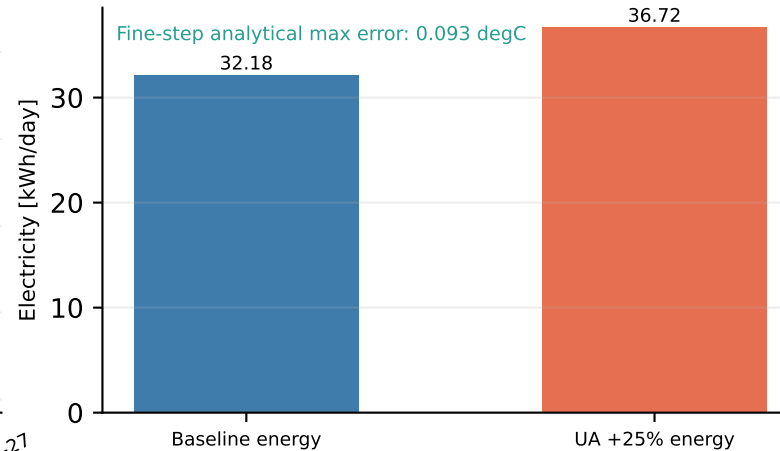
AGENT ADAPTABLE

Schemas • units • playbooks • tests
Vendor-neutral project structure

Held-out zone-temperature prediction



Physical response and acceptance evidence



32.18 kWh

24-hour synthetic baseline

+14.1%

Energy response to UA +25%

0.093 degC

Fine-step analytical max error

0.442 degC

Synthetic held-out temperature RMSE

MODEL LADDER: SYNTHETIC REFERENCE TO MEASURED, HELD-OUT R&D TWIN

UPLOAD

weather + telemetry

VALIDATE

schema + units

CALIBRATE

training period

VALIDATE

held-out period

OPTIMIZE

cost + comfort