SAP & HEM Classifications

The core technical vocabulary in HEM overlaps with SAP (fabric, systems, gains, losses etc.), but HEM introduces a more granular, simulation-style set of terms around time-steps, zoning, controls and system operation. Below are concise comparative lists that will guide you on the radical changes in construction that are bound to follow.

The table below maps key SAP 10.2 classification to their closest Home Energy Model (HEM) concepts, with brief definitions for each. Presumably HEM will provide its own names for these terms when the software is available.

SAP Terminology	HEM Terminology	Brief Definition
SAP rating	Home Energy Model output metric (e.g. annual energy, cost, emissions)	SAP: single index based on annual energy cost for space/water heating, ventilation and lighting. HEM: produces underlying hourly/half-hourly energy, cost and emissions metrics; policy wrappers (e.g. FHS) define rating-style outputs.
DER (Dwelling CO_2 Emission Rate)	Annual CO_2 emissions per m^2 from core engine	Both express annual emissions per m^2 for regulated loads, with HEM calculating from time-resolved fuel use and grid factors.
DPER (Dwelling Primary Energy Rate)	Annual primary energy use per m^2	Primary energy per m^2, but in HEM derived from half-hourly delivered energy and dynamic primary energy factors.
Fabric Energy Efficiency (FEE)	Space heating (and cooling) demand per m^2	Fabric-driven space heating (and cooling) energy per m^2; HEM computes this directly from dynamic heat balance instead of monthly balance.
Thermal transmittance (U-value)	U-value (unchanged meaning)	Heat loss per m^2 per K for each element; numerically the same concept in both models.
Linear thermal transmittance (Ψ-value) / y-value	Linear thermal bridge coefficient	Line-based additional heat loss at junctions; HEM also sums Ψ × length alongside area-based U-values.
Thermal Mass Parameter (TMP)	Thermal capacitance / thermal mass of zones	SAP uses a single TMP; HEM uses heat capacities of constructions to define zone-level thermal mass for dynamic simulation.
Fabric heat loss / Heat loss coefficient	Transmission heat loss coefficient	Sum of fabric and ventilation/conduction losses; HEM holds this internally for each zone and time step.
Ventilation rate / Infiltration	Air change rate per zone (background + system)	SAP: monthly average air change from infiltration and fans; HEM: time-varying infiltration plus mechanical ventilation flows.
Mechanical ventilation / MVHR	Mechanical ventilation system model (fan power, heat recovery)	Same physical meaning; HEM treats fan power and heat recovery continuously over half-hour time steps.
Internal gains	Internal sensible and latent gains by end-use	Both include gains from occupants, lighting, appliances and systems; HEM applies these half-hourly by schedule.

Solar gains	Solar irradiance by surface and time step	SAP: monthly gains via tables; HEM: incident solar per surface each half-hour using weather files and geometry.
Utilisation factor	Dynamic heat balance response	SAP uses an explicit monthly utilisation factor; in HEM the same effect emerges from solving the dynamic zone energy balance.
Mean internal temperature	Zone operative/air temperature profile	SAP: single or few temperatures per month. HEM: explicit zone temperatures at each time step from controls and heat balance.
Standard occupancy & schedules	Wrapper-specific occupancy and control schedules	Both apply standardised profiles for compliance; HEM wrappers (e.g. FHS assessment) define richer time-of-day schedules.
Space heating requirement	Space heating load per zone per time step	SAP: monthly kWh demand before system efficiency. HEM: instantaneous heat output required each half-hour.
Space cooling requirement	Cooling load per zone per time step	Same concept, but HEM models it dynamically with system performance curves.
Domestic hot water (DHW) demand	DHW draw-off profile and storage model	Both calculate annual DHW demand; HEM uses time-series taps, cylinder setpoints and stratification/ losses.
Heating system efficiency (seasonal)	System performance model with part-load and cycling	SAP: seasonal efficiencies and simple adjustments. HEM: load-dependent efficiency with cycling penalties and control effects.
Fuel prices, emission & primary factors	Time-varying cost, CO_2 and primary factors (especially for electricity)	SAP 10.2 already introduces monthly variation; HEM can use higher-resolution factors aligned with time steps.
Energy cost rating (SAP score)	Policy-defined cost/performance indices from HEM outputs	Both aggregate cost from regulated loads; HEM leaves the exact scoring to the policy wrapper.
PCDB (Product Characteristics Database)	Revised product characteristics database for HEM	Both store product-specific test data; HEM uses a redesigned database aligned with its more detailed technology models.
Appendix Q technologies	Integrated technology models in HEM core + database	Bolt-on SAP Appendix Q treatments are replaced by natively modelled technologies within the HEM engine.
SAP worksheet	Open-source Python reference code	SAP: PDF worksheet is normative; HEM: Python codebase is the definitive implementation of the methodology.
SAP monthly calculation	Half-hourly (or similar) time-step simulation	SAP uses monthly quasi-steady-state balance; HEM runs sub-hourly simulations across a full year.
Climate data tables (Appendix U)	Location-specific weather files (hourly)	Both use standard climates; HEM uses time-series weather data consistent with its simulation time step.