

Insulation details & heating system sizing for the different heat pump house type combinations

'Low temperature ASHP in a new build'

House type & insulation details

New build semi-detached, 3 bedrooms:

- ▶ Insulated timber frame walls
- ▶ Pitched roof, 300mm loft insulation
- ▶ Insulated suspended timber floor
- ▶ Modern double glazing
- ▶ Very airtight building with trickle vents

Heating system details

Low temperature air source heat pump:

- ▶ Heat pump rated capacity: 5 kW
- ▶ Back-up heater rated capacity: 3 kW

'Low temperature ASHP in a semi'

House type & insulation details

1959 semi-detached, 3 bedrooms:

- ▶ Uninsulated cavity wall
- ▶ Pitched roof, 100mm loft insulation
- ▶ Uninsulated suspended timber floor
- ▶ Older double glazing
- ▶ Draught proofing applied to windows & doors

Heating system details

Low temperature air source heat pump:

- ▶ Heat pump rated capacity: 6.5 kW
- ▶ Back-up heater rated capacity: 3 kW

'High temperature ASHP in a semi'

House type & insulation details

1959 semi-detached, 3 bedrooms:

- ▶ Uninsulated cavity wall
- ▶ Pitched roof, 100mm loft insulation
- ▶ Uninsulated suspended timber floor
- ▶ Older double glazing
- ▶ Draught proofing applied to windows & doors

Heating system details

High temperature air source heat pump:

- ▶ Heat pump rated capacity: 6.5 kW
- ▶ Back-up heater rated capacity: 3 kW

'Hybrid heat pump in a terrace'

House type & insulation details

1909 mid-terrace, 3 bedrooms:

- ▶ Uninsulated stone wall
- ▶ Pitched roof, 100mm loft insulation
- ▶ Uninsulated suspended timber floor
- ▶ Older double glazing
- ▶ Draught proofing applied to windows & doors

Heating system details

Hybrid heat pump (low temperature ASHP with a gas boiler):

- ▶ Heat pump rated capacity: 5 kW
- ▶ Condensing gas boiler rated capacity: 15kW

'Hybrid heat pump in a semi'

House type & insulation details

1959 semi-detached, 3 bedrooms:

- ▶ Uninsulated cavity wall
- ▶ Pitched roof, 100mm loft insulation
- ▶ Uninsulated suspended timber floor
- ▶ Older double glazing
- ▶ Draught proofing applied to windows & doors

Heating system details

Hybrid heat pump (low temperature ASHP with a gas boiler):

- ▶ Heat pump rated capacity: 5 kW
- ▶ Condensing gas boiler rated capacity: 15kW

'Hybrid heat pump in a detached'

House type & insulation details

1930 detached dwelling, 4 bedrooms:

- ▶ Uninsulated cavity wall (with heavy plaster)
- ▶ Pitched roof, 130mm loft insulation
- ▶ Uninsulated suspended timber floor
- ▶ Older double glazing
- ▶ Draught proofing applied to windows & doors

Heating system details

Hybrid heat pump (low temperature ASHP with a gas boiler):

- ▶ Heat pump rated capacity: 8 kW
- ▶ Condensing gas boiler rated capacity: 18kW

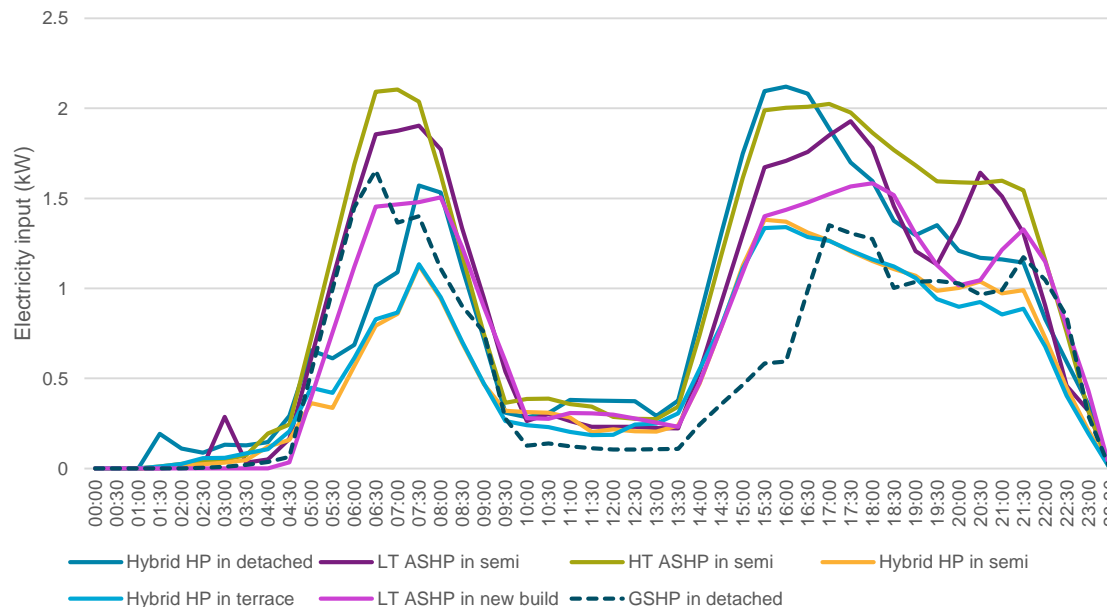
Additional load profile analysis

Following the completion of the main report for ENWL, a small extension to the study was carried out to generate additional heat pump load profiles.

The additional analysis that was carried out is:

- ▶ Development of half hourly load profiles that reflect the **'average' of uni-modal** (a single heating period per day) **and bi-modal** (two heating periods per day) heat pump operation.
- ▶ Calculation of the **annual electricity consumption** for the different heat pumps in different house types (see table below).
- ▶ Generation of load profiles for the 6 heat pump house types on a typical day in **each month of the year**.
- ▶ Generation of load profiles for **GSHPs** (see graph below). We expect a modest amount of GSHPs to be installed on ENWL's network by 2030, but for the future deployment of heat pumps to be dominated by ASHPs and hybrids (therefore GSHPs had not been included in the original analysis). For this analysis, a GSHP was modelled in a detached dwelling, with load profiles being generated on the same days as simulated in the ASHP analysis.

Load profiles for different heat pump-house types (considering uni-modal and bi-modal operation) on an average peak winter day



The table below illustrates the **annual electricity consumption** of the different heat pumps in different house types, during a year with an average winter.

Heat pump-house type	Annual electricity consumption (kWh)
Hybrid HP in detached	4,543
LT ASHP in semi-detached	6,415
HT ASHP in semi-detached	7,272
Hybrid HP in semi-detached	2,922
Hybrid HP in terrace	2,946
LT ASHP in new build	6,097
GSHP in detached	3,236