LIFE SustainHuts

Sustainable Mountain Huts in Europe

French huts

FFCAM has joined the SH project in 2019 : not enough time to implement renewable energies but yet wants to participate. FFCAM proposed to compare:

- a recently refurbished hut (Dent Parrachée) as State Of Play at the End (SOPE)
- With a old comparable hut (Evettes) as State Of Play at the Beginning (SOPB)

Refuge de la Dent Parrachée

Refuge des Evettes

French huts

Shelter name	**Dent Parachée (SOPE)**	**Evettes (SOPB)**
Presentation	A warm shelter located in the Vanoise national park. A balcony-terrace, 500 m above Grand Lake of Plan of upstream, facing South, and beyond the deep valley of the Arc, at the border peaks of Maurienne.	Located on a large mound close to a lake with full amenities. The ice site of the refuge is exceptional and despite its withdrawal, the Evettes glacier remains nearby.
Activities	alpinism, rock climbing, hicking, skiing	alpinism, rock climbing, hicking, skiing
Altitude (masl)	2520	2594
Guarded period	From early March to mid-May and early June to end of September. the rest of the year on reservation	From mid-March to mid-May and mid-June to mid-September. the rest of the year on reservation
Beds (guarded/ungarded)	42 / 24	64 / 20
Overnight stays (2019)	4738	3637
Construction	1994	1971
Most recent main refurbishment	2017-2018	90's
Electrical supply	Solar panel + small hydroelectric power station)	Solar pannel
Genset	Gas	Diesel
Heating	Solar thermal panel + wood stove + pellet stove	Wood stove
Ventilation	Central exhaust-only system	Natural
Sanitary Hot Water	Solar thermal panel	Gas

French huts

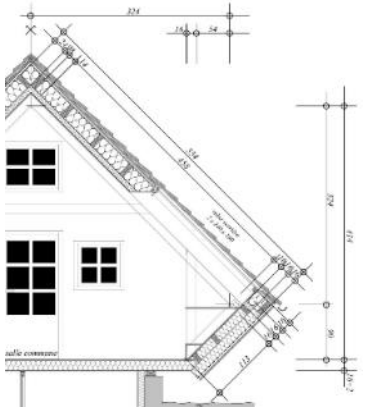
Dent Parrachée refurbishment:

- New solar PV panels

- New solar thermal panels

- Small hydro-turbine

- Hut insulation



French huts

Sustainable refurbishment results :

- Solar thermal: ↘ 4,000 litres of gas / year
- PV panels + hydro-turbine: ↘ 107 litres of gas to produce ↗ 727 kWh of electricity more
- Globally : ↘ 1.5 t of CO_2 for de monitored period (July 2020 to Sept. 2021)

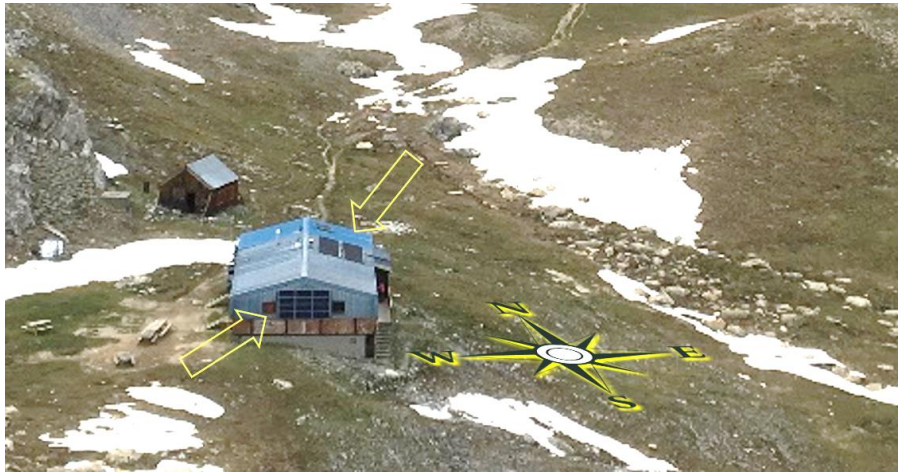
French lessons learnt

Solar arrays implantation (1/2):

Solar arrays implantation is usually optimized for summer PV production (highest frequenting)
But batteries still require a float charging current during winter.

→ Pay attention to snow cover

→ Dedicate some PV panels winter load or use tiltable mount



French lessons learnt

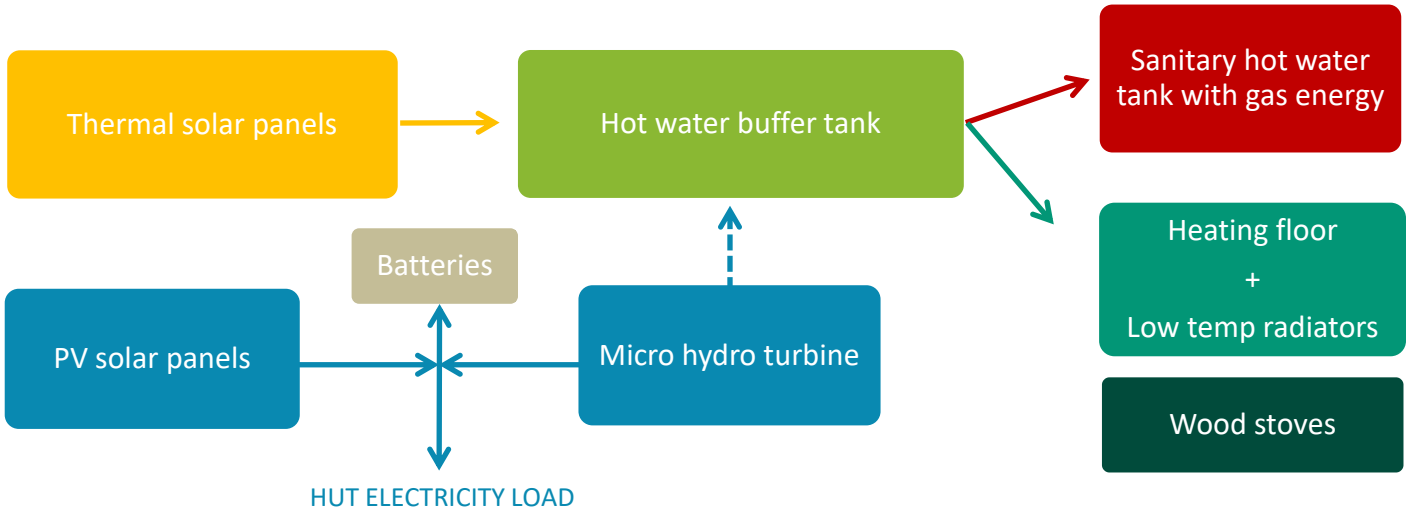
Solar arrays implantation (2/2):

Dent Parrachée tiltable mount

French lessons learnt

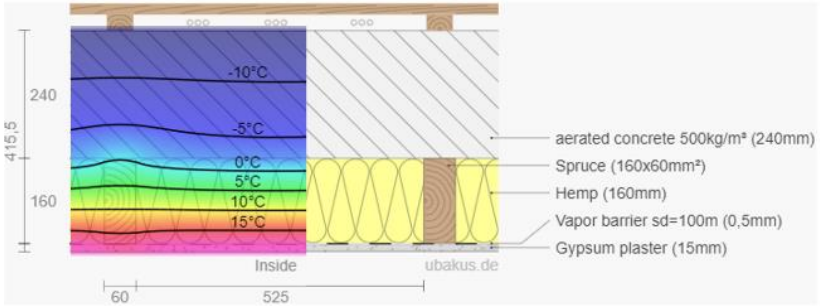
Hydro turbine:

- We've learnt that hydro turbine can be quite difficult to adjust for fine settings.
- We've also learnt that even small hydro turbines are able to provide lots of electricity: they require a discharge system when all the produced electricity cannot be used or stored in batteries.
  → For the Dent Parrachée hut, the excess of electricity generated by the hydro turbine goes in an electric resistor inside the main hot water tank.

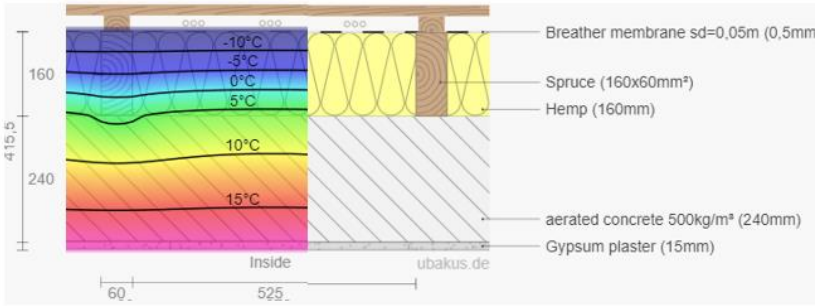


Insultation and moisture management (1/2):

- Best insulation is usually exterior insulation to avoid thermal bridges: construction walls remain on the warm side and moisture condensation is not a problem.
- With interior insulation or wood walls, moisture condensation can become an issue: in this cases, construction walls and wood walls remain on the cold side of the insulation. Therefore, water vapor coming from inside the hut through the insulation meet the cold surface of the walls, then condensate inside the wall causing long-term pathologies.
  → In case of adding interior insulation, some precautions must be taken like vapor retarder membrane or perspirant “breathing” walls.

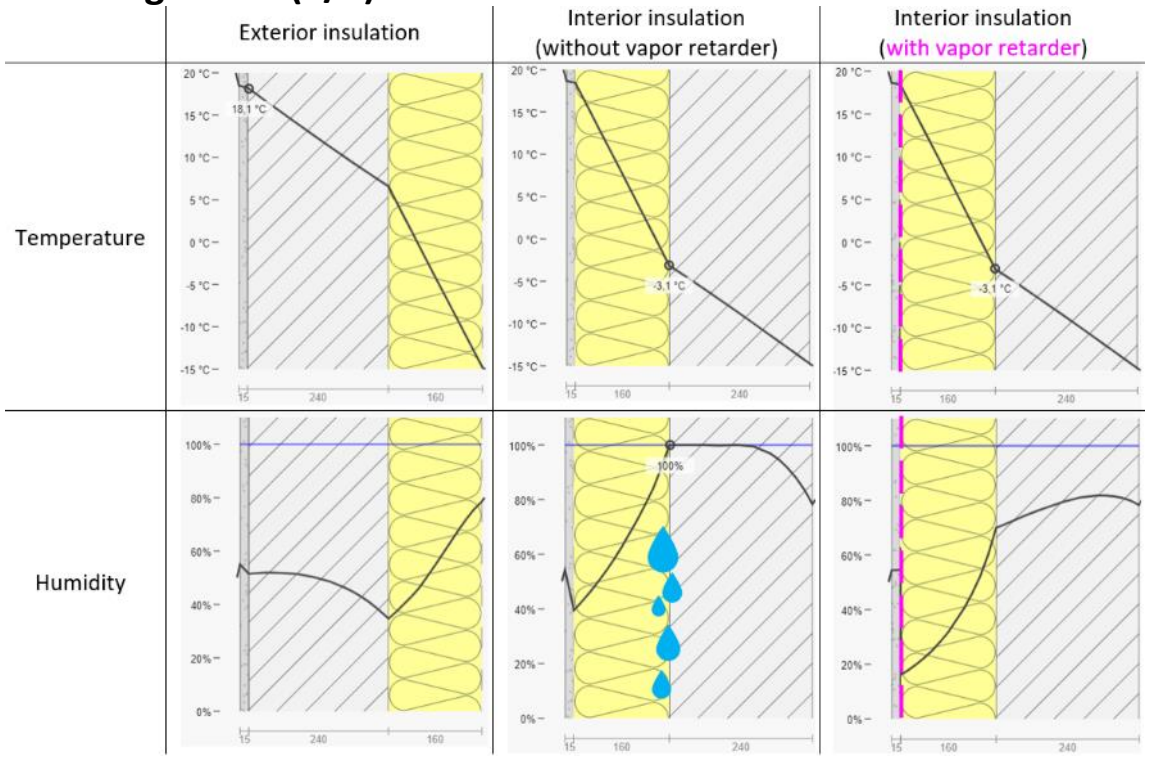


Interior insulation



Exterior insulation

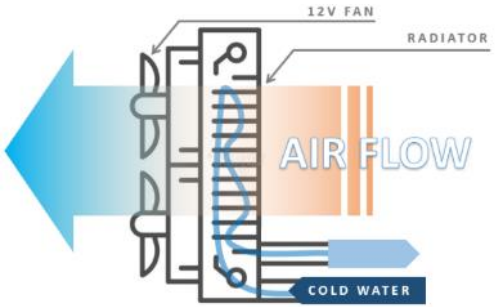
Insultation and moisture management (2/2):



French lessons learnt

Low-tech fridge:

- Take advantage of cold water running through a water cooler radiator and place behind it a fan (or small CPU computer fans) to blow cool air in the room: you'll get a fresh room to keep vegetables and cheeses! (Idea by P. Boldo & F. Buisson)



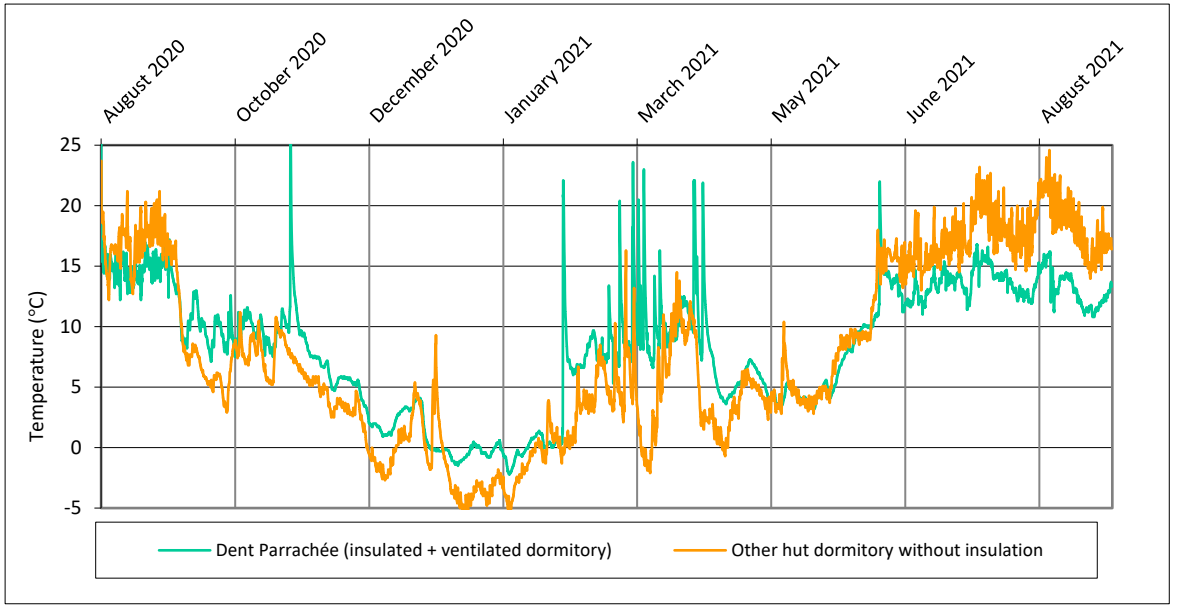
French lessons learnt

General lessons:

- We learnt that a whole refurbishment for both energy systems and building insulation can:
  - decrease fossil fuel consumption thanks to the insulation which will lower the energy demand
  - increase hikers and jeepers comfort

For instance, with temperature monitoring inside a dormitory, we notice that:

- Dent Parrachée insulation add +5°C in the dormitory during winter even without heating (unkeeped period).
- Mechanical ventilation of the Dent Parrachée dormitories lower temperature by -5°C during summer occupation.



Thank you for your attention!

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