ENERDRAPE

Performance metrics

FACT SHEET

Capacities at Enerdrape

Consider a typical multi-family residential building with 3 floors above the ground and a total space conditioning area of 2200 m². This building is served by 1 underground parking level with a height of 3 meters. In this project, 128 Enerdrape panels can be installed in the parking.

For a constant flow rate and a given heat carrier fluid circulating within Enerdrape, the harvested/injected thermal power depends on the difference between the inlet temperature of the heat carrier fluid and the average temperature of the wall. For nominal conditions, approximately 100 W can be harnessed per panel, which corresponds to approximately 116 W produced per panel with a heat pump using this source. (*Hypothesis*: *COP: 4.9, HP type*: *ecoGEO+B/C 5-22, ecoforest*).

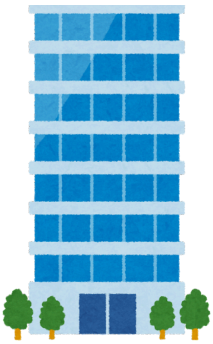
By considering a heating time of 8 months and 1700 operating hours, as it is typical in Switzerland and other countries worldwide, each Enerdrape panel can provide approximately 197 kWh/year. Therefore, the available number of 128 panels in this use case can provide a total of 25 MWh/year.

The SIA building standards (Source) ovide different values of thermal energy consumption depending on the construction year of buildings.

	New building	Existing buildings after 2016	Existing buildings before 2016
Heating energy needs	11.2 [kWh/m²]	19 [kWh/m²]	112.9 [kWh/m²]

Based on this information, an Enerdrape installation in the considered building would be able to cover:

- The needs of 2200 m², if the building is new (corresponding to 100% of the needs)
- The needs of 1280 m², if the building is already existing and was constructed after 2016 (corresponding to 58% of the needs)
- The needs of 218 m², if the building was constructed before 2016 (corresponding to 10% of the needs)



Enerdrape can meet 100% of the thermal energy needs of buildings, depending on their construction age and availability of underground floors.

Each Enerdrape panel, characterized a surface area of 1 m², can meet the thermal energy needs (e.g., for space heating) of the following surfaces :

- **17.2 m² in new buildings**
- **10 m² in existing buildings constructed after 2016**
- **1.7 m² in existing buildings constructed before 2016**

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Environmental benefits of Enerdrape

The Enerdrape system offers significant environmental benefits by harnessing renewable energy from underground surfaces to reduce CO_2 emissions.

For a constant flow rate and a given heat carrier fluid circulating within Enerdrape, the harvested/injected thermal power depends on the difference between the inlet temperature of the heat carrier fluid and the average temperature of the wall. For nominal conditions, around 100 W can be harnessed per panel, therefore about 116 W per panel can be produced by a heat pump using this source. (*Hypothesis*: *COP*: *4.9, HP type*: *ecoGEO+B/C 5-22, ecoforest*).

During the heating time of 8 months (as in Switzerland), 1700 hours of work are used to harness around 197 kWh per panel.

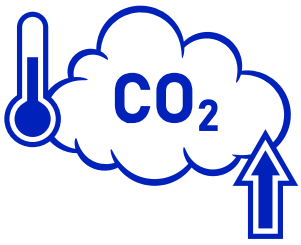
The useful electricity for heat production in one year would then be 53 kWh per panel.

	Oil	Electricity (Swiss Mix)
CO_2 emission coeffiscient	0.319 [kg/kWh]	0.139 [kg/kWh]

Swiss SIA building standards

Swiss SIA building standards state that oil heating systems generate 319 [$gCO_{2\,equ}$] per kWh of heat. Electricity in the Swiss mix emits, according to the same standard, 139 [$gCO_{2\,equ}$] per kWh consumed. With these assumptions, the equivalent CO_2 savings would amount to 60 [$kgCO_{2\,equ}$] per panel. On average, a tree absorbs around 25 kg of CO_2 per year (Source)

One Enerdrape panel allows saving the equivalent amount of CO_2 absorbed each year by approximately 2 trees.



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