



St. Franziskus Church - Ebmatingen, Switzerland

Author: Cristina Polo (SUPSI)

Photovoltaic roof-integrated system

Solar

What is the solution?

The Roman Catholic Church of St. Francis Ebmatingen, built in 1989, urgently needed renovation. An old oil heater, an outdated insulation and a partially damaged roof ensured a disproportionately high energy requirement of 84,400 kWh/year. In winter 2018/19, the structural and energetic renovation followed with new insulation, geothermal heat pumps, photovoltaics with thermal energy (PVT) and LED lighting. As a result of these measures, the total energy consumption to date has decreased by 35% from 84,400 kWh/year to 54,700 kWh/year. The character of the church was still preserved. The renovation costs amount to CHF 1.2 million. Of the 543 m² PV system that is optimally integrated into the roof, 161 m² are equipped with PVT modules. In addition to electricity, they also produce 41,800 kWh/year of heat, which is conducted 300 m deep into the ground in summer which a part is recovered in winter. The installed power of the PV / PVT system is 90 kW. This means that 78,900 kWh/year of CO₂-free electricity is generated annually and 41,800 kWh/year of thermal energy is generated with the 161 m² thermal solar collectors. Both plants generate a total of 120,700 kWh/year. This means that the PEB church has an energy supply of 221%. Church renovation serves as a role model both in terms of energy and ecology. The St. Franziskus Ebmatingen church received the Swiss PlusEnergieBau Solar Prize in 2019.

Why does the solution work in terms of compatibility with conservation and technical aspects?

St. Francis Church has been transformed into a CO₂-neutral PEB building with a 221% energy efficiency. Erected in 1989 and extended in 2008, the 2018

partial refurbishment, including roof, facades and a new heating system with geothermal heat pumps was limited to the original building. Nevertheless architectural unity is achieved. A solar BIPV system combined with Photovoltaic thermal collectors, (PVT collectors) have been well integrated in the complex surface of the existing roof of the modern renovated Church of St. Francis Ebmingen. The roof areas are completely covered with photovoltaic modules. It was possible to use the same modules, with only slightly varied connection details, for both the conventional in-roof photovoltaic system and for the PVT system (hybrid). The roof edges and the eaves are identical, resulting in a very uniform architectural design.

Description of the context:

Together with the experts involved, the building commission had different variants for the heating replacement have been tested. The building commission and church maintenance unanimously recommended the present project with geothermal probe heat pump heating and combined photovoltaic thermal system (power generation, thermal regeneration of the earth in the probe area, room cooling) and at the same time to carry out the structural renovation. The Windows in the old part of the building received a new, modern, better insulating glazing, as a replacement for the old glazing, which has replaced the end of the had reached the end of its life span. The heat losses through the glass could thus be reduced to about one third, which will have a positive effect on heating costs. It also improves the comfort of the rooms. The renovation and redesign of the lighting in the church interior and the exterior lighting was modernised from halogen downlight technology to energy-saving tunable white LED lamps. The roof was leaking in places and had to be renovated.

Pros and cons of the solution:

The solar photovoltaic integrated system and solar thermal PVT is well integrated in the complex surface of the existing roof. It complies with the geometric and spatial and construction compatibility criteria required by current regulations for the integration of solar systems in historic buildings (grouping, coplanarity with the roof slope, respect for the eaves lines and roof edge, joint precision, etc.). The aesthetic, material and color compatibility with the existing roof is optimal because it respects the original colour of the roof. The reflection rate is slightly higher with respect to the original roof tile that has been replaced. The final result is very good and well-integrated.

Type of data available (level of information, simulation):

Römisch-katholische Kirchgemeinde Egg ZH Pfarrvikariat Maur ZH:

ENERGETISCHE SANIERUNG KIRCHE ST. FRANZISKUS EBMATINGEN

(Festgottesdienst 24.3.2019) St. Franziskus Ebmatingen church renovation project was awarded by the Swiss Solar Prize in 2019 and have won a European Solar Prize the same year, 2019. Link:

[https://solaragentur.ch/sites/default/files/g-19-10-](https://solaragentur.ch/sites/default/files/g-19-10-02_solarpreispub19_fueradag_v2.p042_43.pdf)

[02_solarpreispub19_fueradag_v2.p042_43.pdf](https://solaragentur.ch/sites/default/files/g-19-10-02_solarpreispub19_fueradag_v2.p042_43.pdf) European solar prize brochure:

https://www.eurosolar.de/en/images/EVENTS/ESP/ESP_2019/Brochure_ESP2019.pdf

there any related Service of the Swiss Radio and Television RSI, in Italian

language news on Friday 15.11.2019, Published on: 15 November 2019, 21:24,

Link: [https://www.rsi.ch/news/svizzera/Una-chiesa-a-zero-emissioni-](https://www.rsi.ch/news/svizzera/Una-chiesa-a-zero-emissioni-12421722.html)

[12421722.html](https://www.rsi.ch/news/svizzera/Una-chiesa-a-zero-emissioni-12421722.html) BIPV module Product: Eternit Integral II Manufacturer: Eternit

AG / SI Module GmbH Cell technology: Mono-crystalline Cell colour: Black Front

glass type/customization: Transmission-optimised solar glass (2×3.2 mm ESG)

with anti-reflective coating Dimensions: 1300x880x12mm Nominal power: 190

Wp Specific power: 166 Wp/m² Module weight: 11 kg Specific weight: 9.62 kg/m²

Are there any related publications or pictures of the solution?



PV panels ©Studer



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Factsheet