

A landscape photograph of a field at sunset. The sun is low on the horizon, creating a bright yellow and orange glow. The sky is a deep blue with some wispy clouds. The field is filled with tall grasses and some small white flowers. The text 'Obnovljivi izvori energije' is overlaid in the center of the image in a light blue, outlined font.

Obnovljivi izvori energije

Izvori energije

- ▶ Energija– sposobnost tijela za obavljanje rada
- ▶ Učinci energije: toplina, svjetlost, gibanje, zvuk itd.
- ▶ Oblici energije: toplinska, mehanička, kinetička, potencijalna, električna, kemijska, nuklearna
- ▶ Osnovna jedinica za energiju– $1\text{J}=1\text{Ws}$
 - ▶ Najčešće korištena mjera za potrošnju energije je kWh
($1\text{kWh}=3,6\text{ MJ}$)



Izvori energije

NEOBNOVLJIVI

Ugljen

Nafta

Prirodni plin

Nuklearna fisija

Nuklearna fuzija

OBNOVLJIVI

Sunčeva energija

Energija vjetra

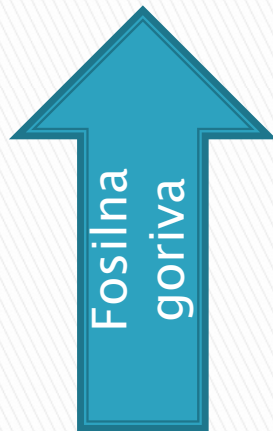
Energija vodotoka

Energija biomase

Toplina zemlje

Energija morskih mijena i
morskih valova

Geotermalna energija



- Ograničena opskrba
- Onečišćuju okoliš
- Uzrokuju klimatske promjene

Uporaba Sunčeve energije

▶ SUNCE

- središnja zvijezda Sunčevog sustava
- masa= 2×10^{30} kg (milijun puta veće od mase Zemlje)
- Udaljenost od Zemlje 150 milijuna km
- Temperatura na površini Sunca je oko 5760 K
- Snaga zračenja oko $3,8 \times 10^{26}$ W
- Na površinu Zemlje dospjeva 120000 TW (9000 puta više od proizvodnje primarne energije na Zemlji)





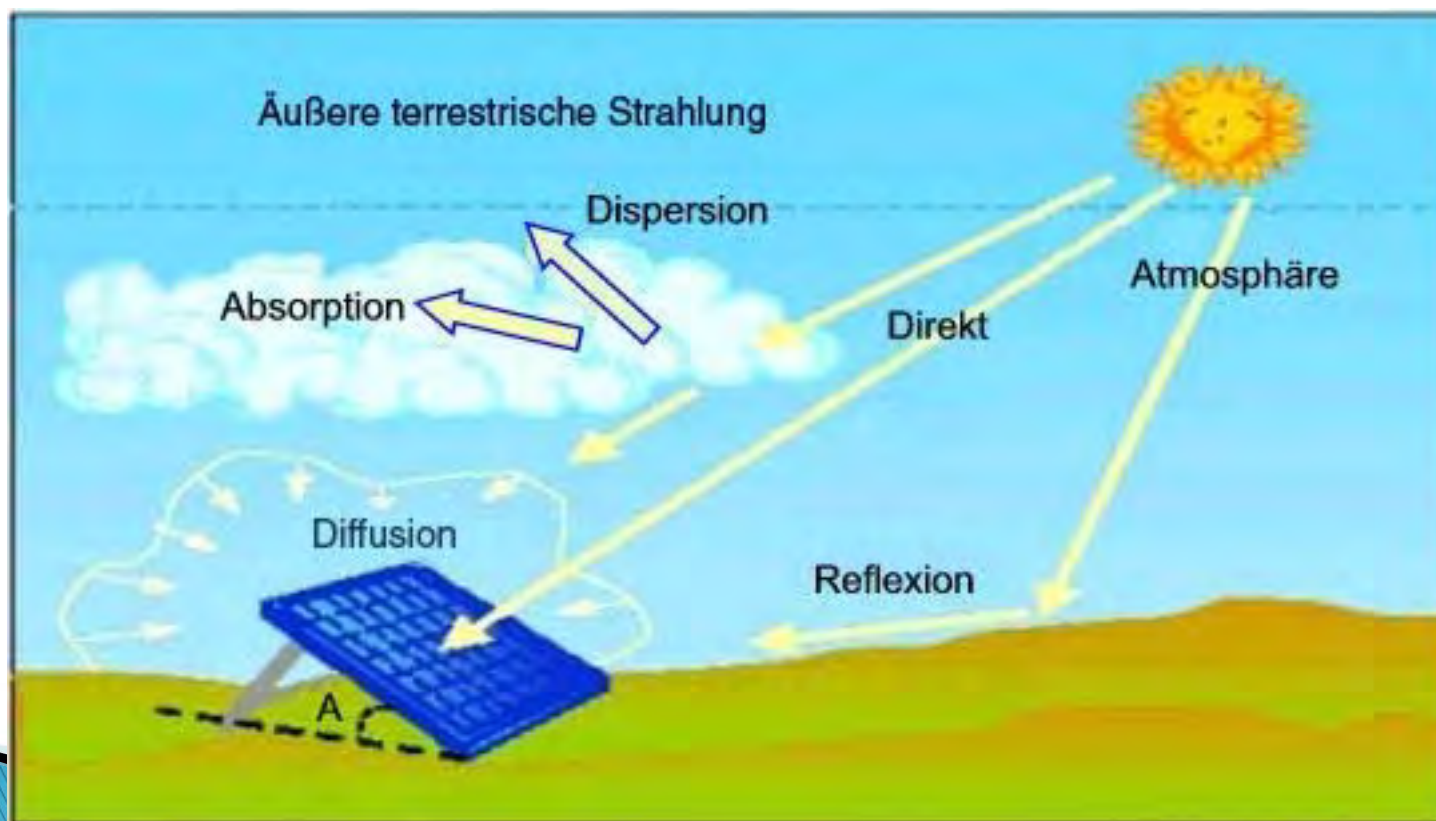
- zalihe ugljena
- zalihe nafte
- zalihe urana
- zalihe plina
- godišnja potrošnja energije u svijetu
- godišnje Sunčevo zračenje

Elektromagnetsko zračenje



Sunčevo zračenje na površini Zemlje

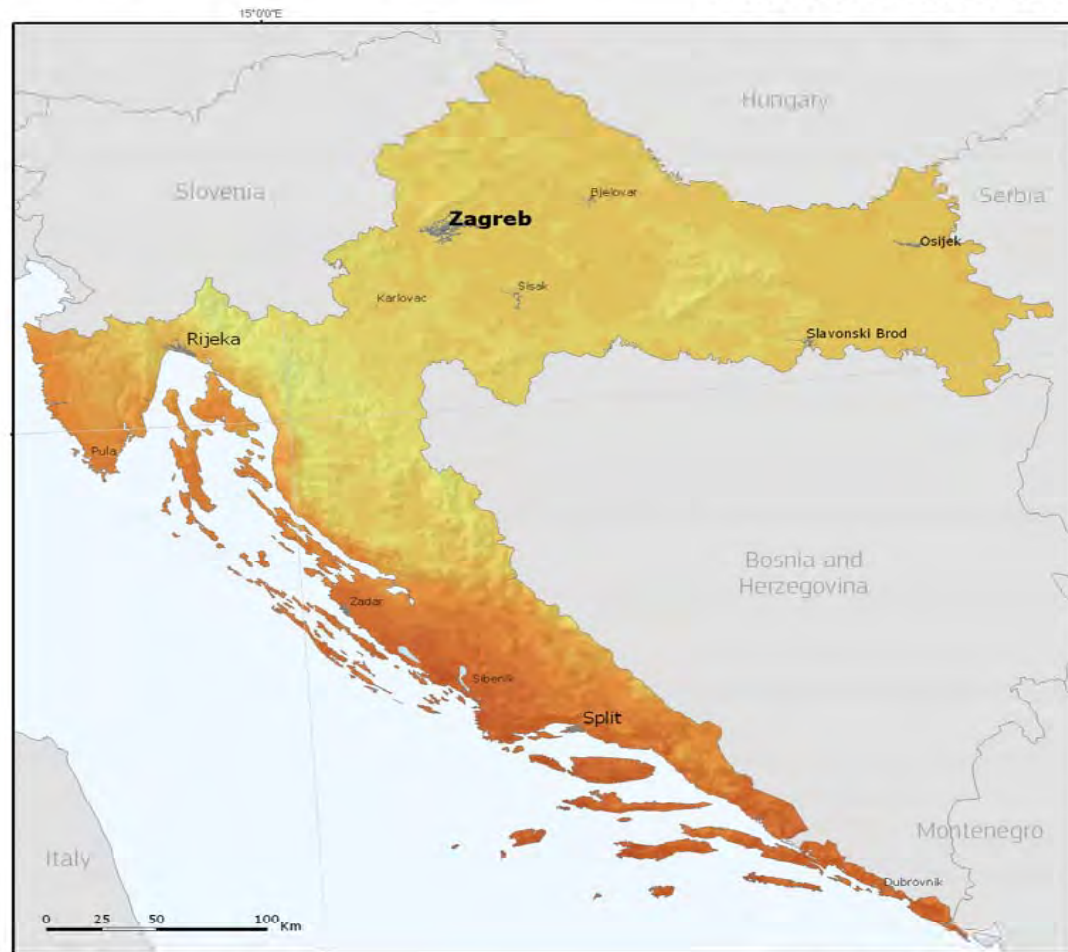
- ▶ solarna konstanta = 1367 W/m^2
- ▶ globalno zračenje: direktno zračenje i difuzno zračenje



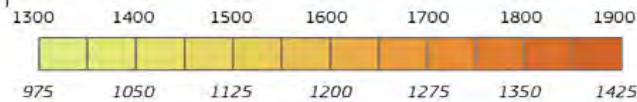
Global irradiation and solar electricity potential

Optimally-inclined photovoltaic modules

CROATIA / HRVATSKA

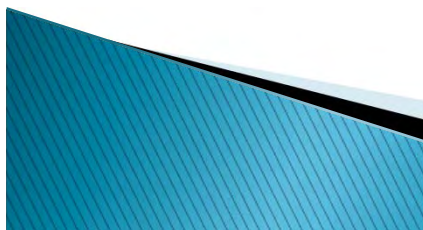


Yearly sum of global irradiation
[kWh/m²]



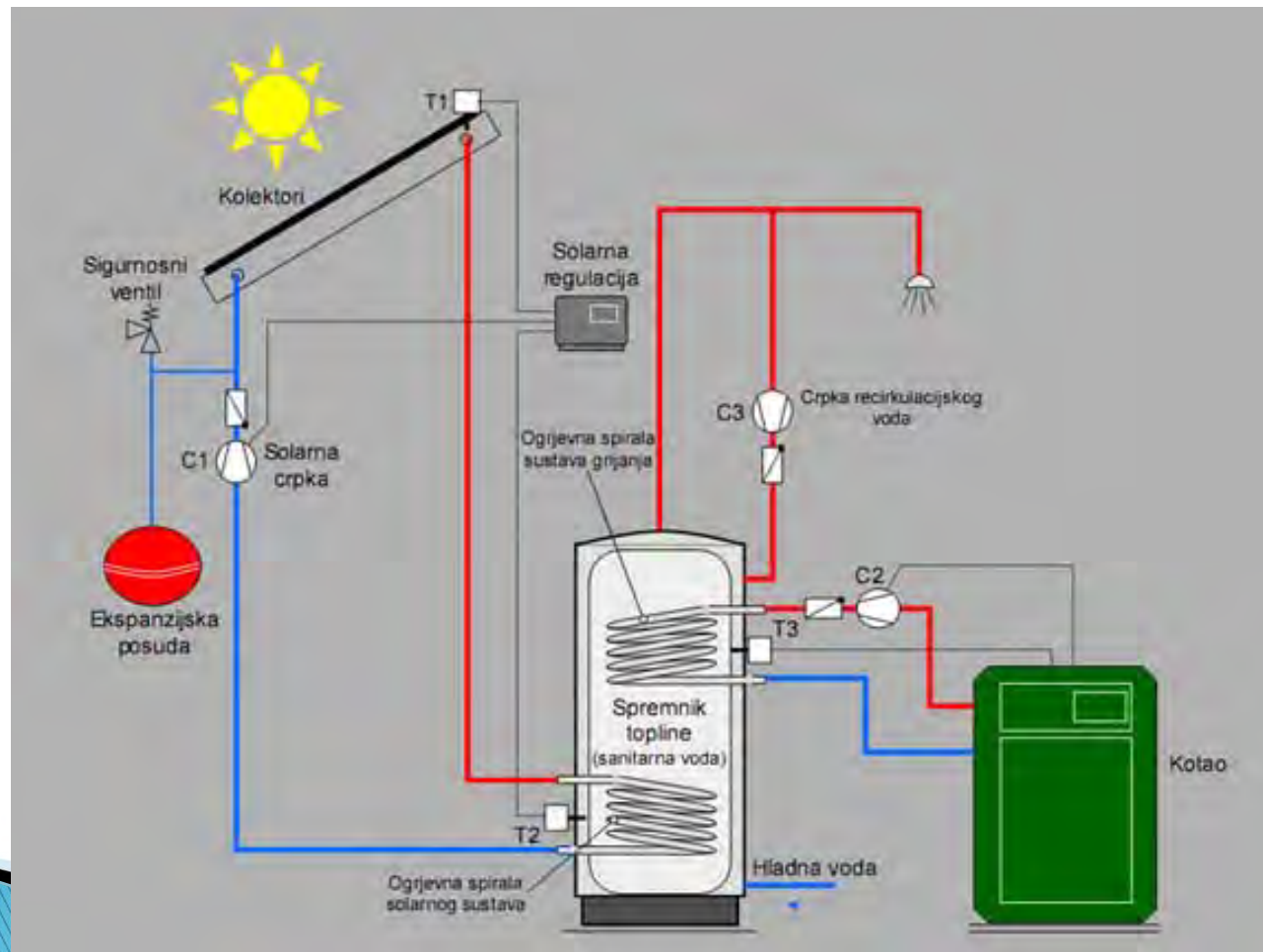
Yearly sum of solar electricity generated by 1kW_p
system with performance ratio 0.75
[kWh/kW_{peak}]

Projection: Lambert Azimuthal Equal Area, WGS84, lat 52° lon 10°
Source of auxiliary data: CORINE Land Cover, DTM SRTM30, GISCO database, Geonames, Natural Earth

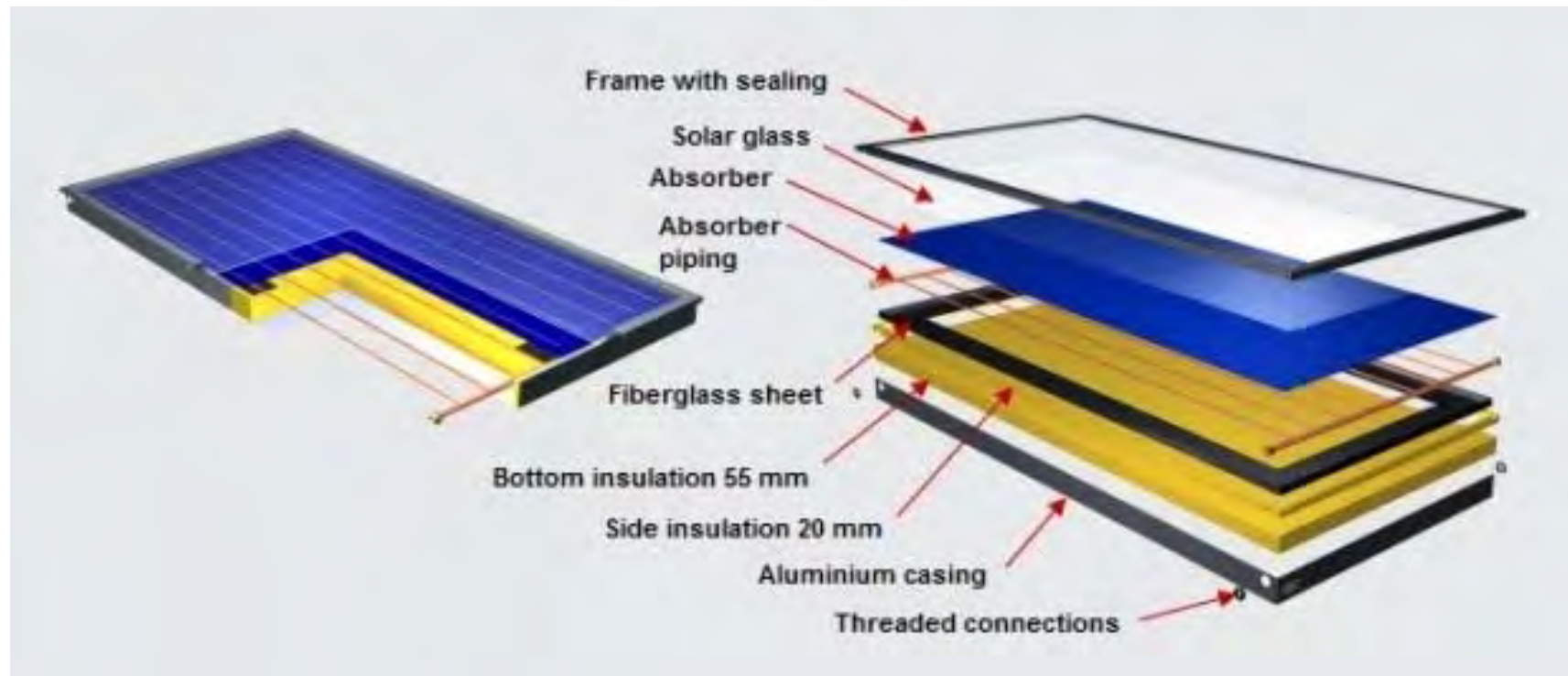


Energija Sunčevog zračenja za grijanje i pripremu potrošne tople vode

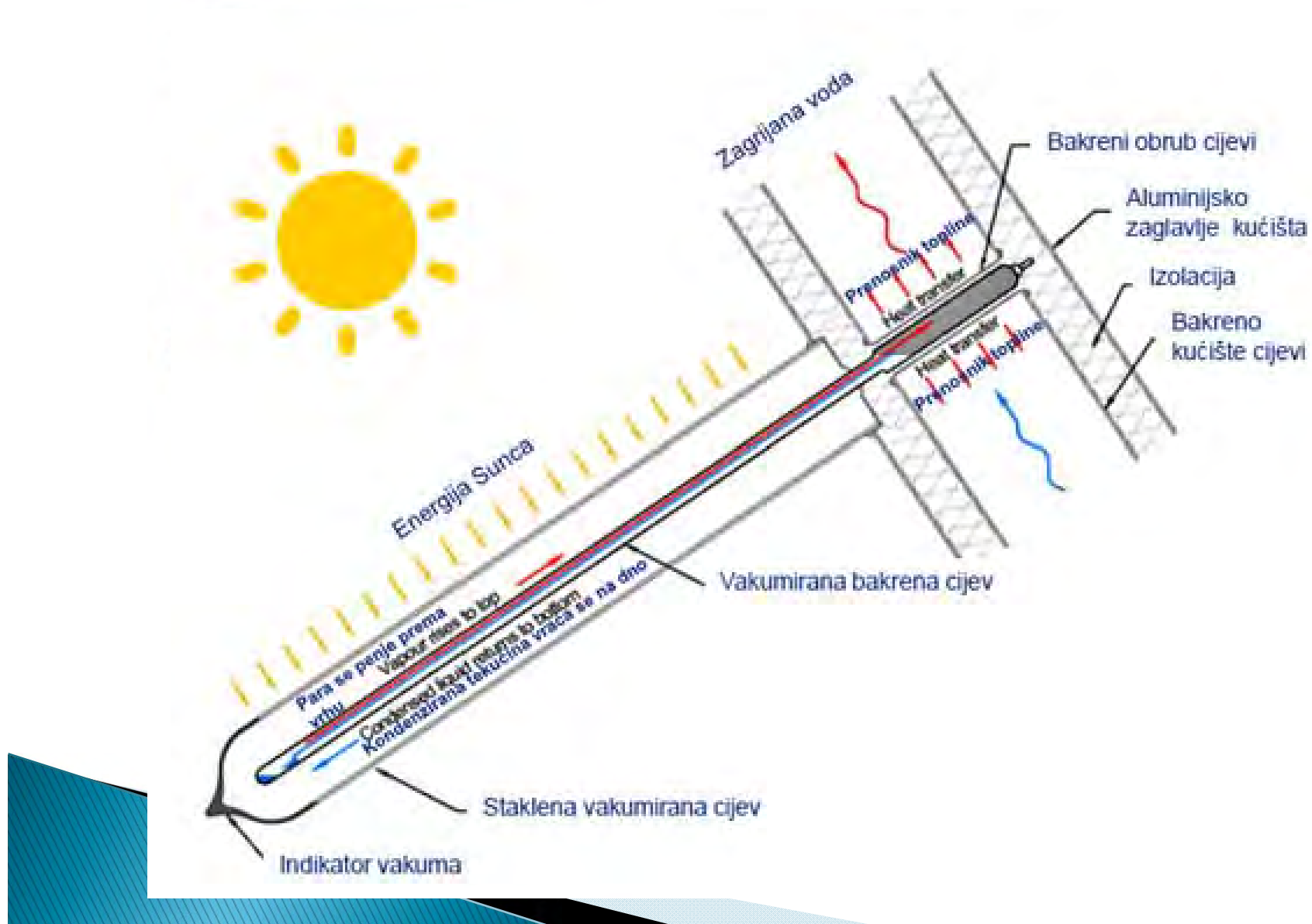
- ▶ Sunčani toplovodni sustav



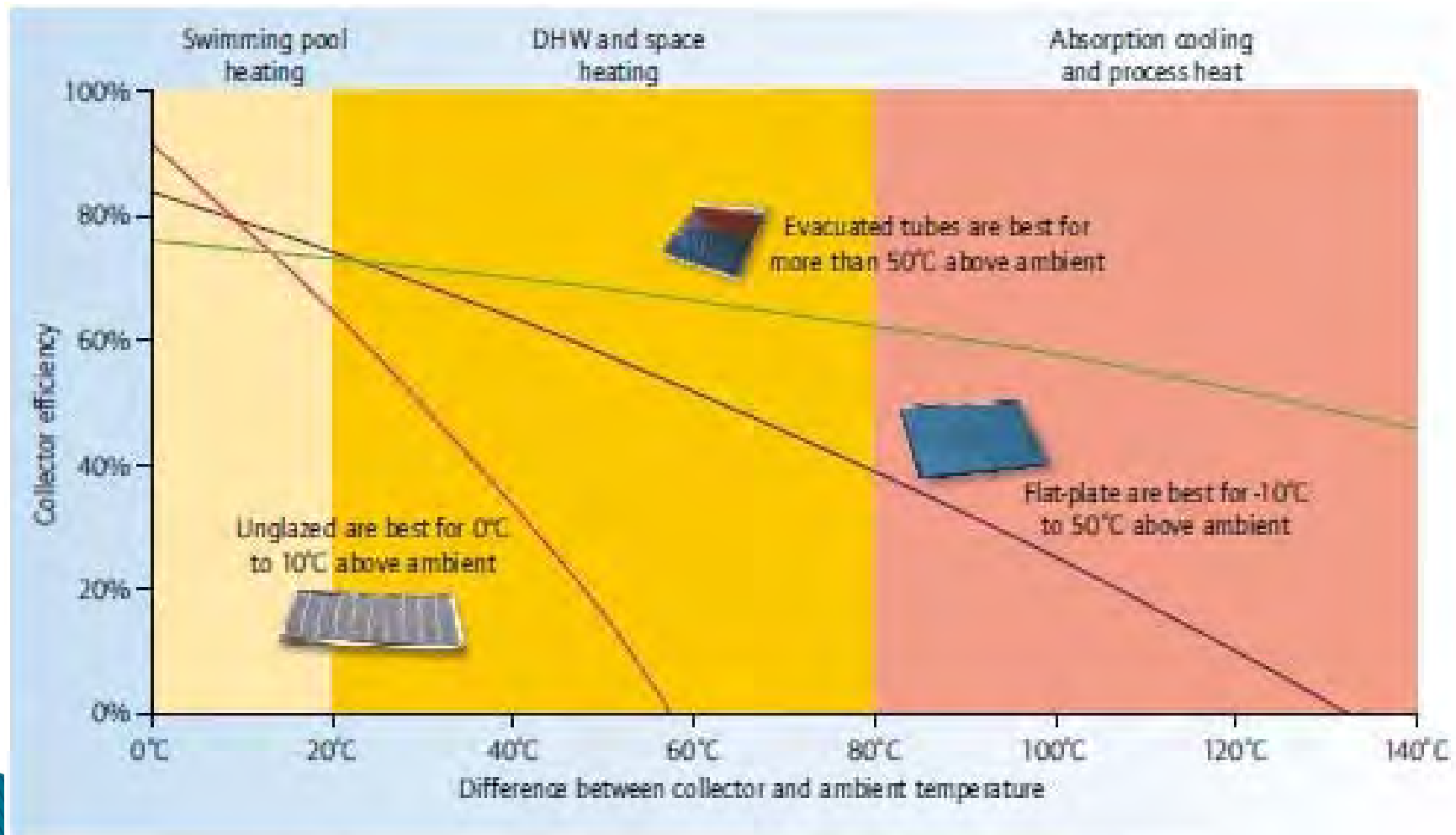
- ▶ Sunčani termalni kolektor
 - pločasti kolektor



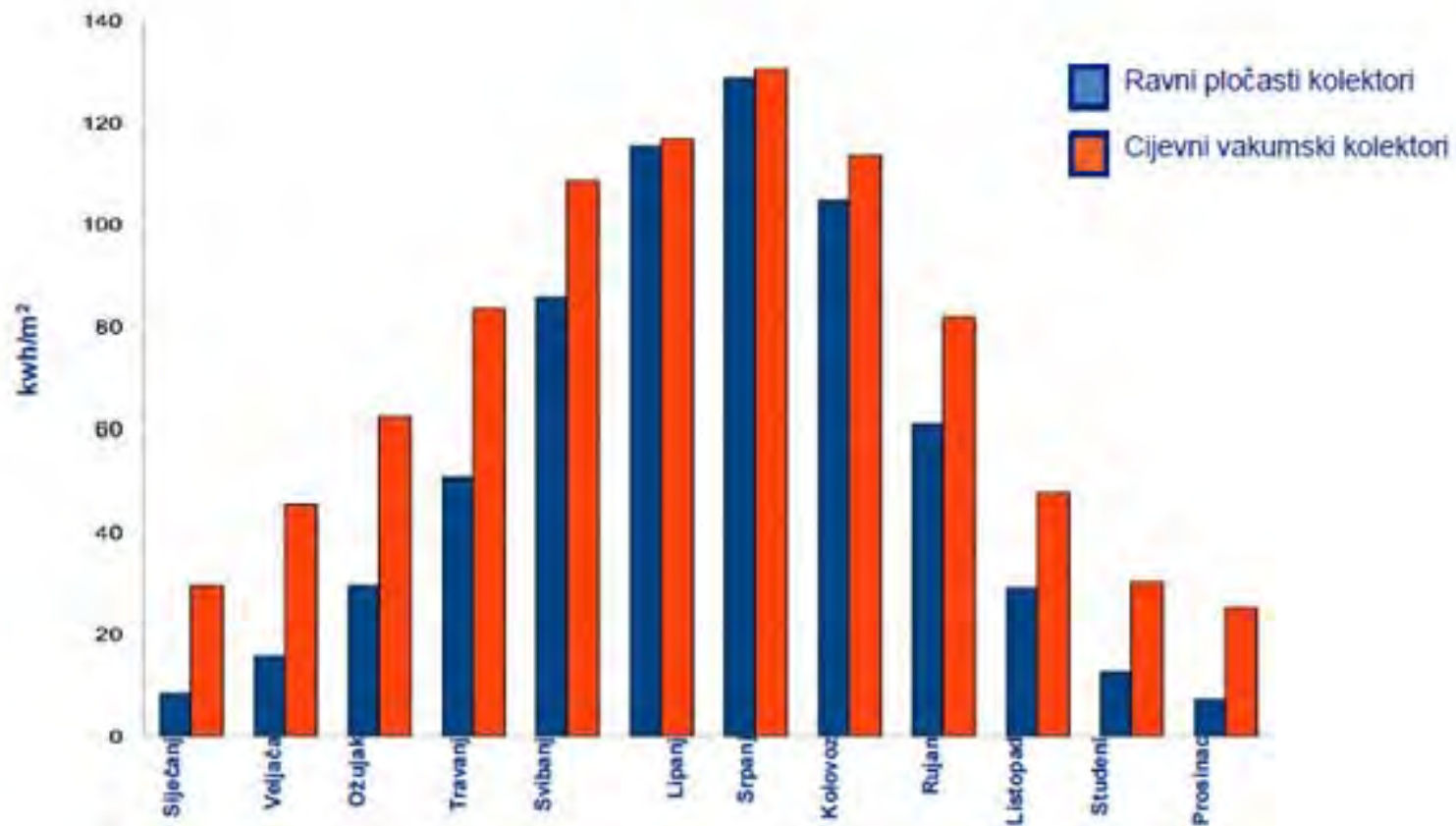
- o vakumski kolektor



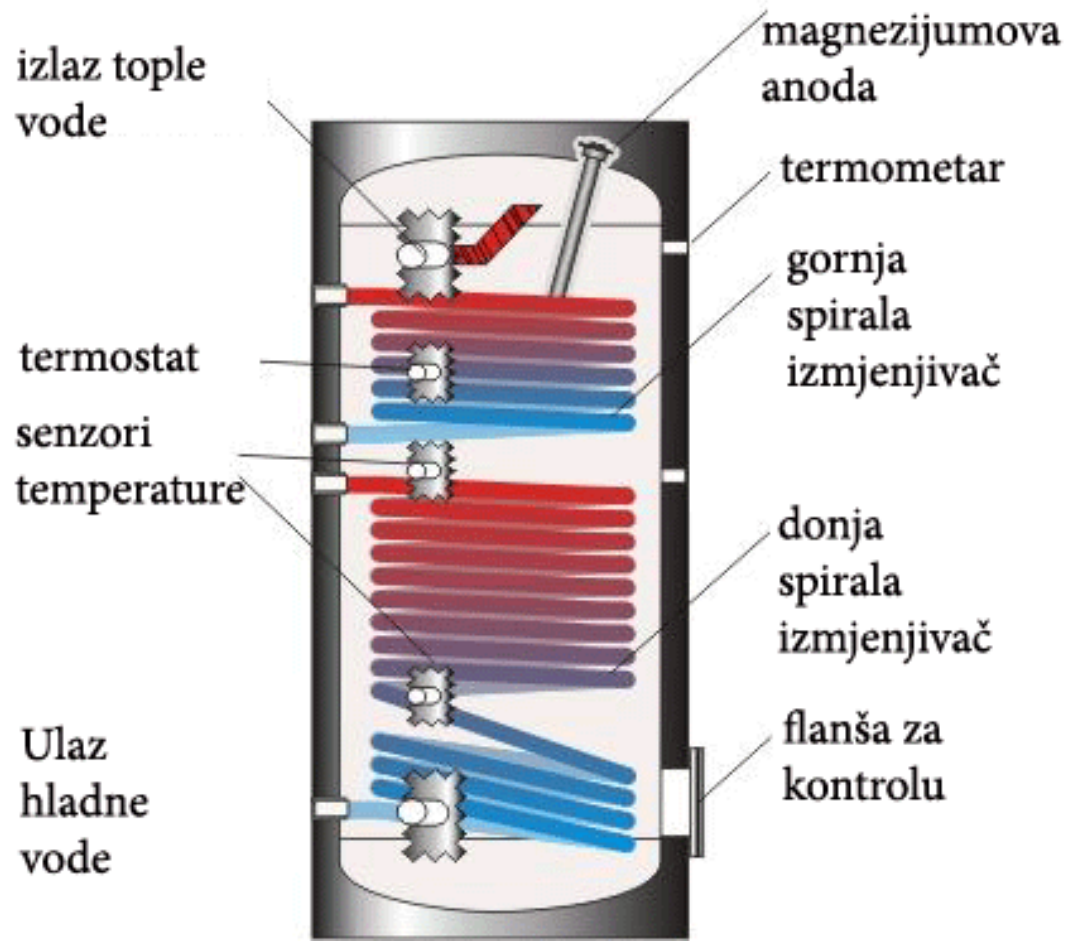
► Sunčani kolektori– krivulje efikasnosti



► Usporedba učinkovitosti ravnih i vakumskih kolektora



► Spremnik PTV



▶ Solarna pumpna grupa



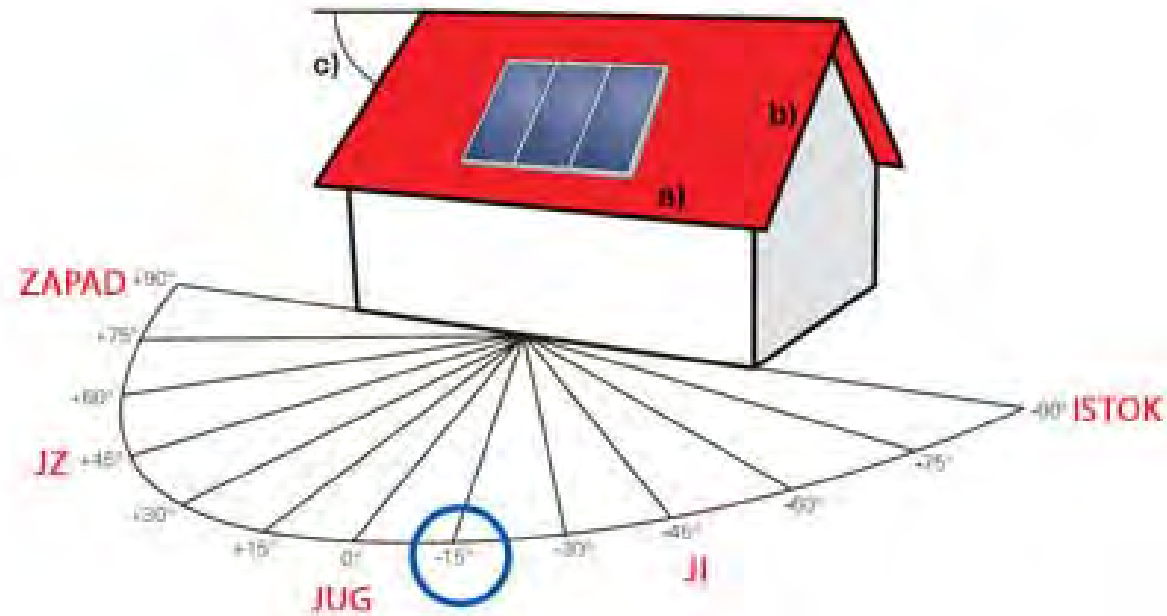
▶ Solarna regulacija



▶ Termosifonski solarni sustav



- ▶ Orjentacija i nagib kolektora i panela



▶ Samogradnja solarnog kolektora



▶ Načini montaže kolektora

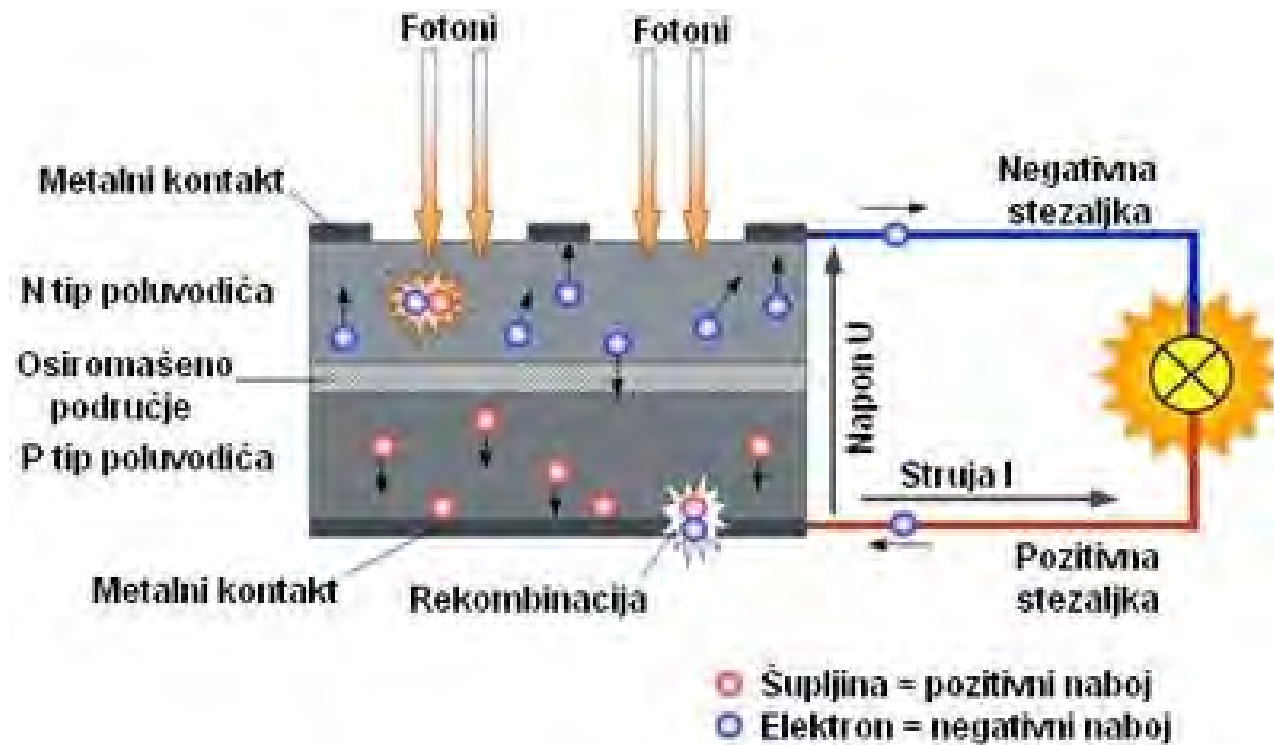


Energija Sunčevog zračenja za proizvodnju električne energije

- ▶ Izravna pretvorba sunčane energije u električnu
- ▶ Princip rada: fotoelektrični efekt
- ▶ Otkrio Becquerel 1839., objasnio Einstein 1905.– Nobelova nagrada 1921.



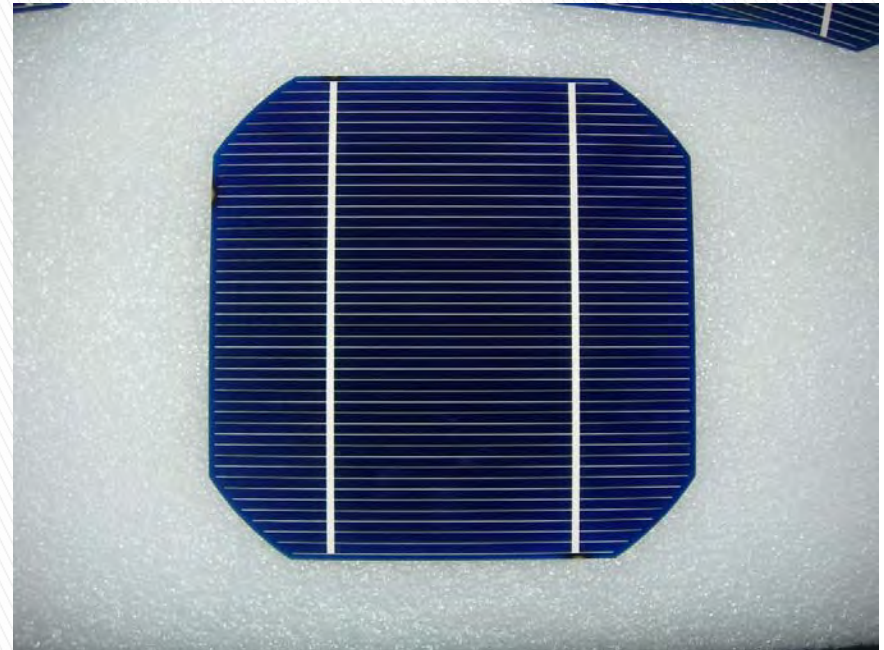
- ▶ Pod djelovanjem fotona izbijaju se elektroni iz osiromašenog područja PN spoja (obično silicij) i putuju prema negativnom sabirniku, a pozitivne čestice (šupljine) pozitivnom sabirniku – EM sila (napon). Strujni krug kroz trošilo



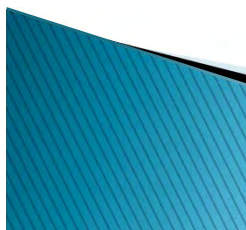
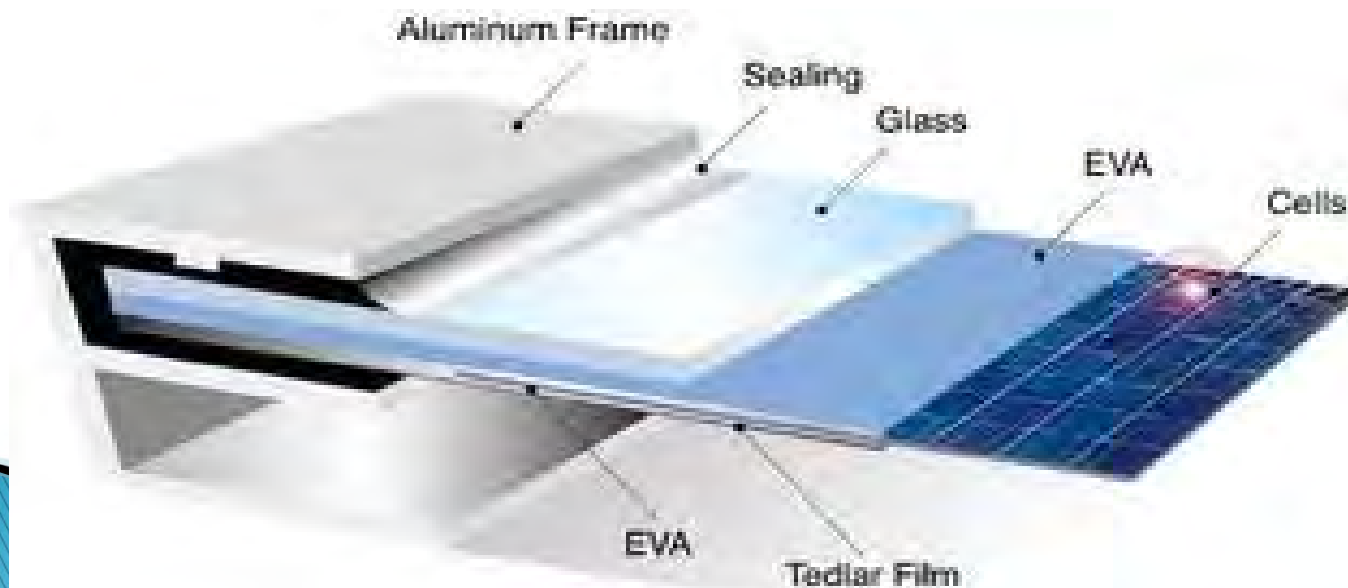
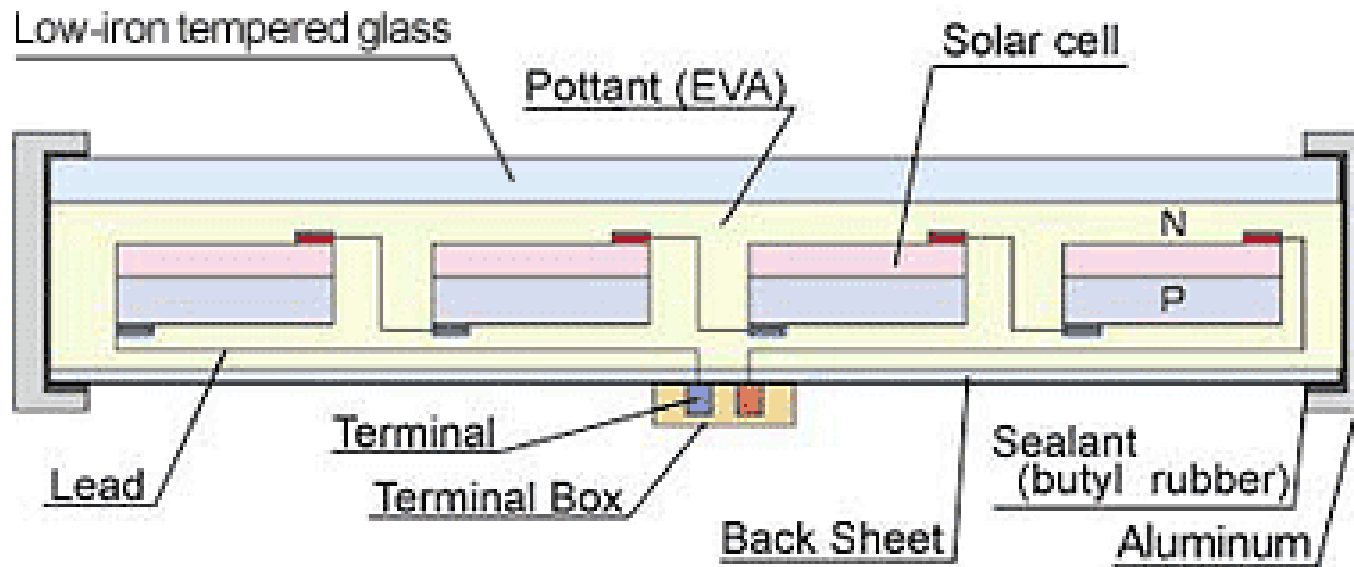
► Vrste fotonaponskih ćelija

- polikristalične η : 15%
- monokristalične η : 17%
- amorfne η : 9%
- CdS/Cu₂S η : 12%
- GaAlAs/GaAs η : 24%
- GaAs η : 27%

Naponi jediničnih ćelija od 0,5 do 1 V

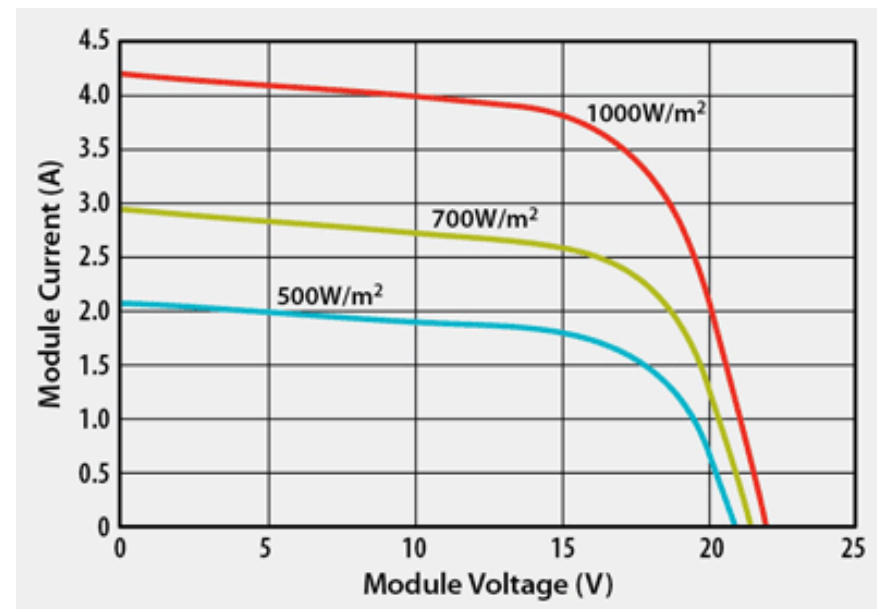


► Fotonaponski moduli





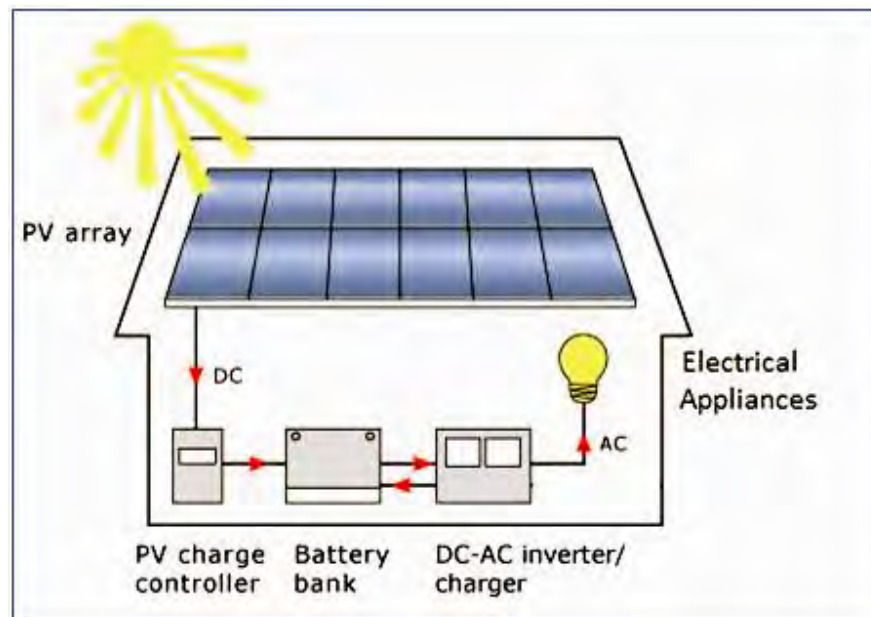
FN moduli

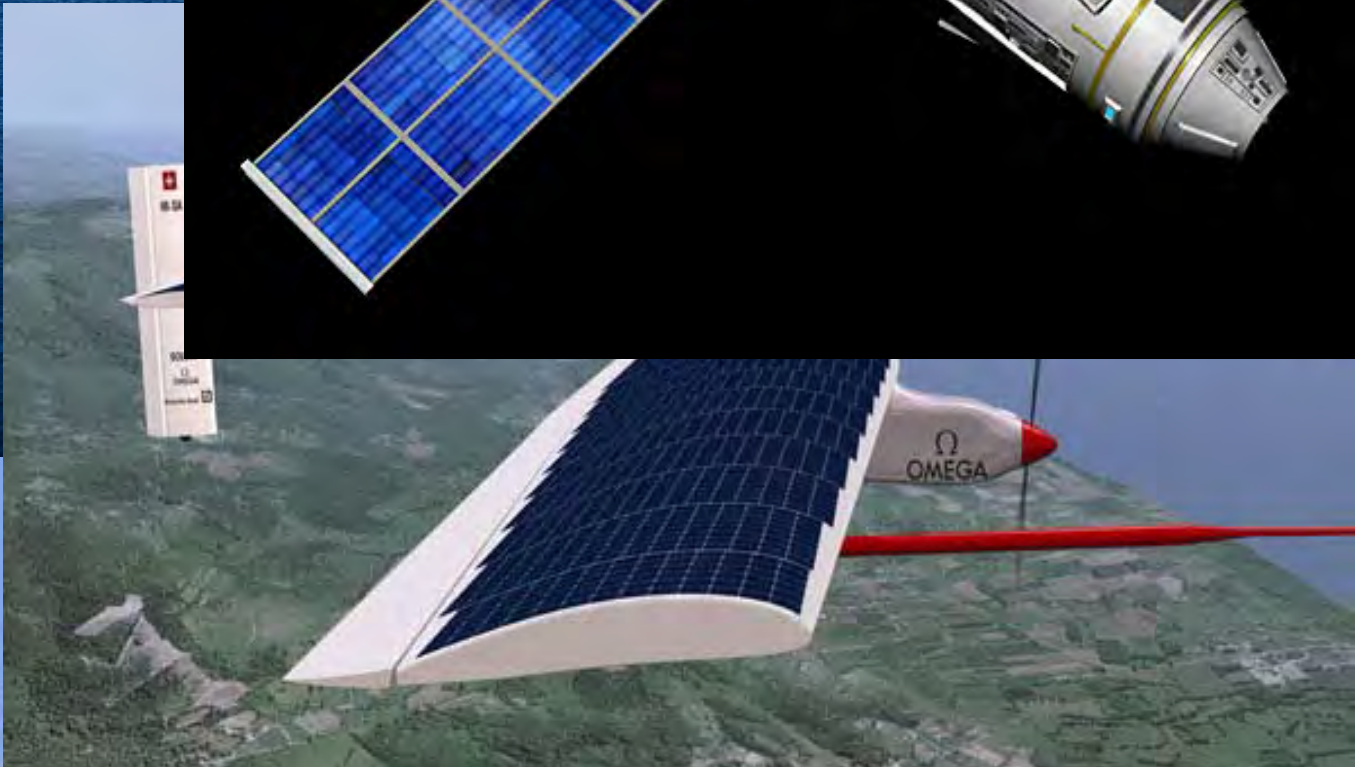


U-I karakteristika FN modula

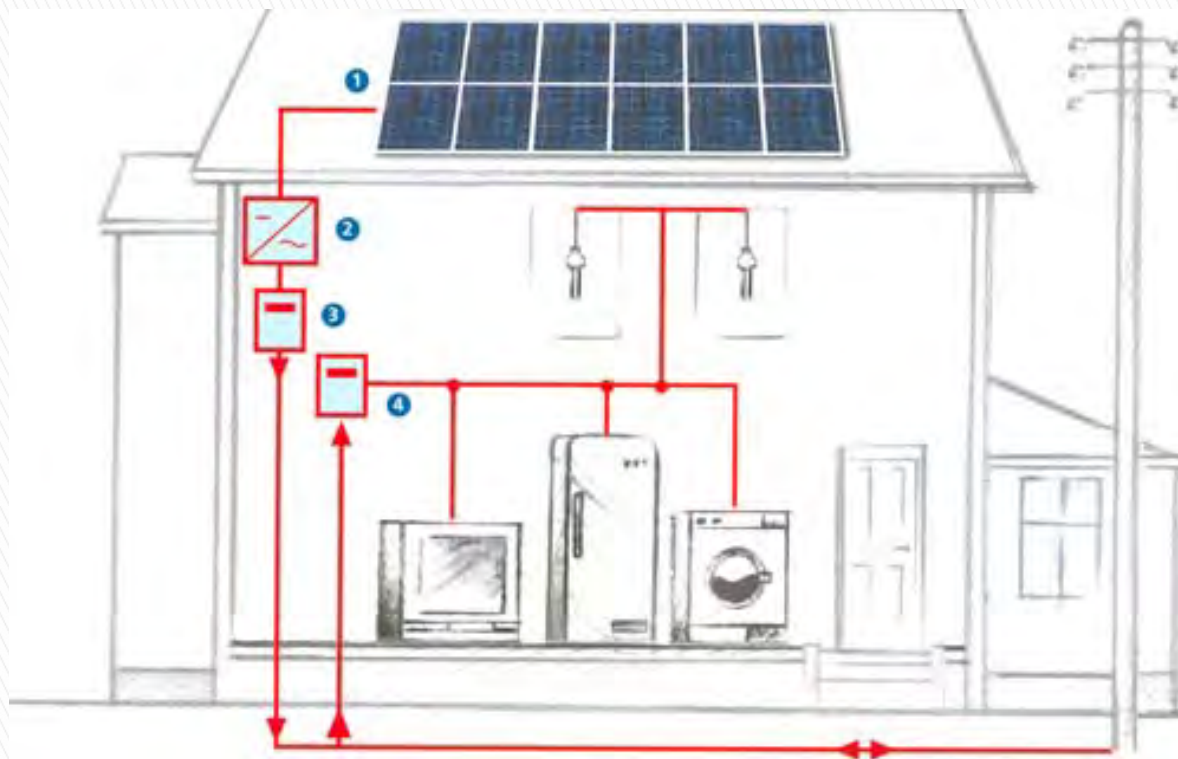
► Primjena FN modula

- otočni sustavi
 - FN paneli
 - Regulator punjenja
 - Baterija
 - DC/AC inverter
 - trošilo





- mrežom vezani sustavi
 - FN moduli
 - DC/AC mrežni inverter
 - Brojilo





A photograph of a sunset over a body of water. The sun is low on the horizon, casting a warm orange and yellow glow across the sky. The sky is filled with wispy clouds, some of which are illuminated by the setting sun. The water in the foreground is dark with some ripples. In the distance, there are dark silhouettes of mountains or hills. The overall scene is peaceful and scenic.

Hvala na pozornosti!

Mirko Gašljević ing.stroj.