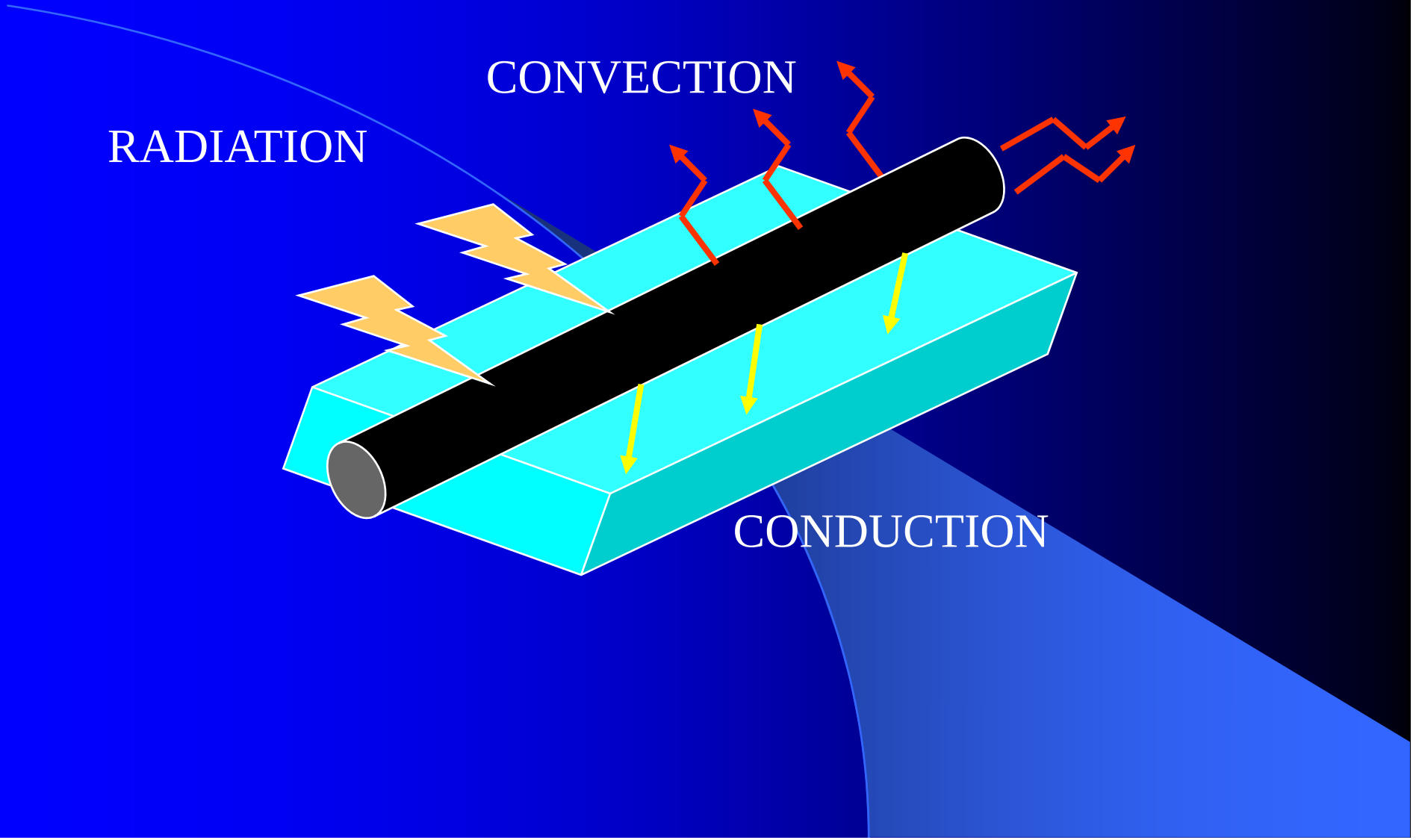
SUNSTAR collectors for SWIMMING POOL HEATING

Heat Transfer Options

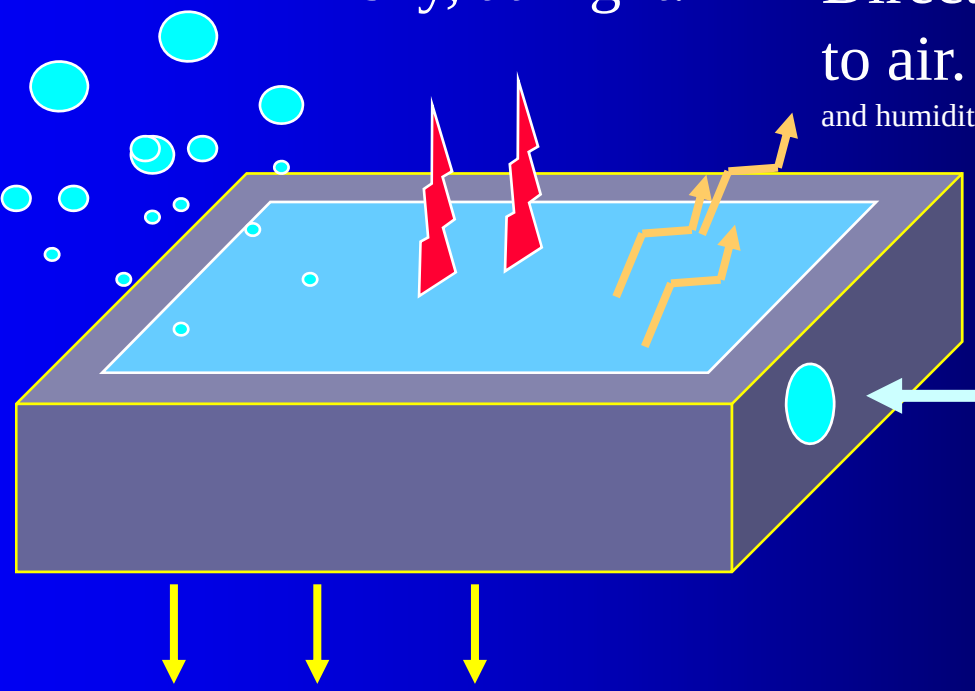


The HEAT BALANCE in an open swimming pool

Evaporation

Radiation to sky, at night.

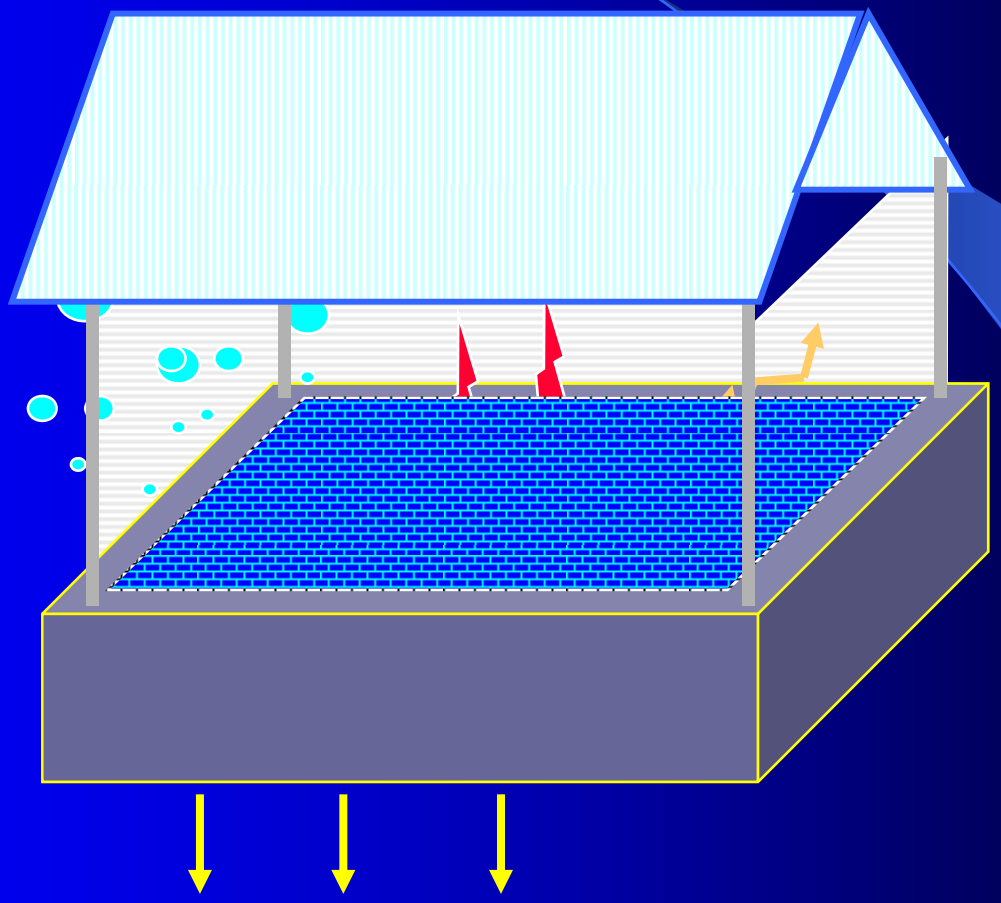
Direct Convection to air. (depends on wind velocity and humidity



Cold water inlet

Ground heat transfer

Pool's HEAT CONSERVATION



POOL HEATING

- Oil/Gas Heater
- Electric Heat Pump
- Solar Energy

•Q: What is the amount of ENERGY needed to add 2 ºC to a 100^3 liter pool ?

A: 100^3 liter = 100,000 Liter (Kg). Therefor – a total of 200,000 KCal needed. (compare with 21 Kg Oil/Gas, or 58 Kw/Hour Heat pump)

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* 1Kcal is needed to heat 1 Kg of water in 1 º C.

Solar Collectors – common requirements:

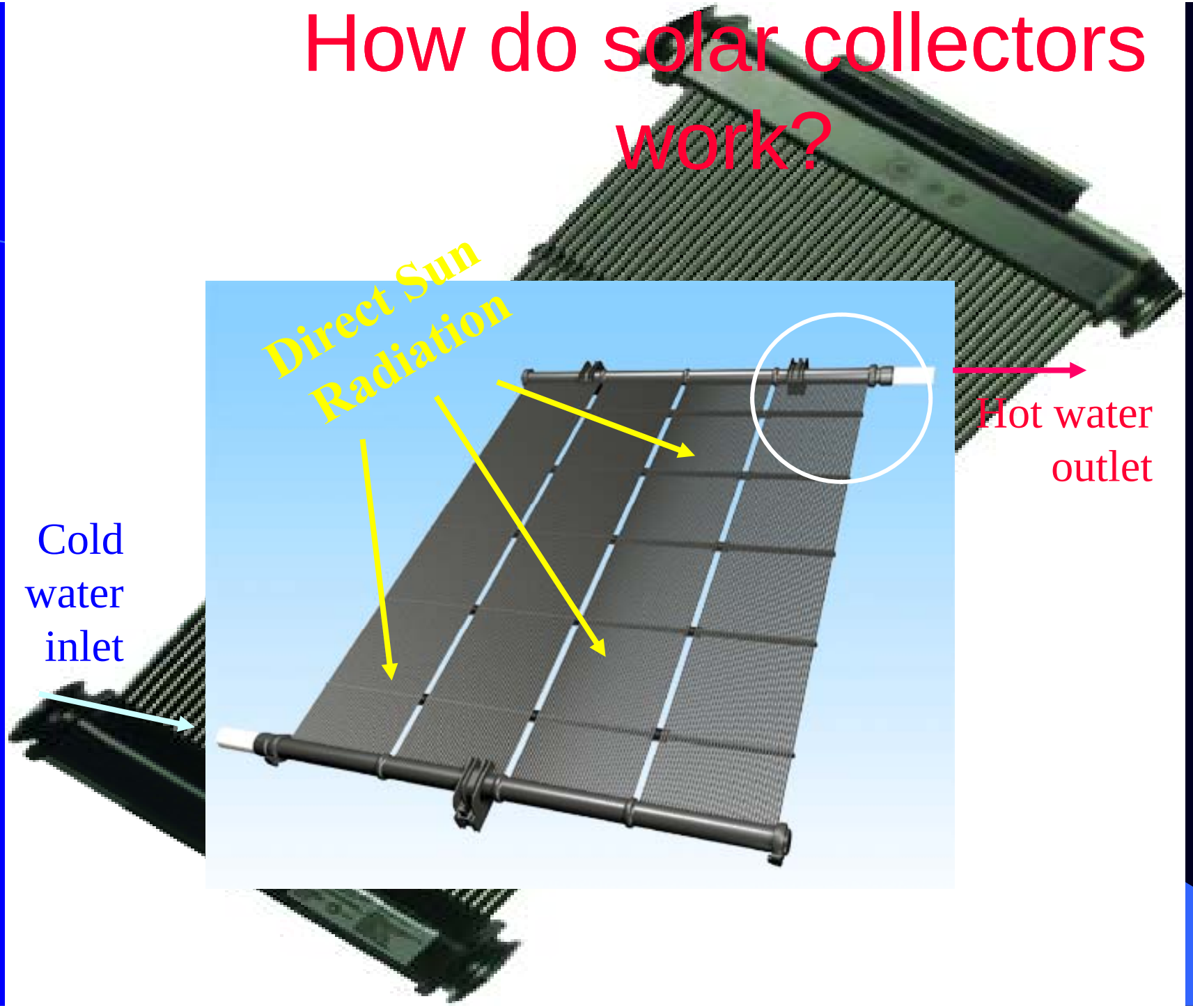
- Working Temp. : 20-35 °.C
- Resistance to pool water (with chemicals)
- Heating large quantities of water
- Reliability and Stability for many years
- Low weight
- Competitive price
- Esthetics : a choice of colored panels, to blend with the existing roof.
- Easy to repair. No need to replace an entire panel.
- Long warranty coverage

SUNSTAR has them ALL!!

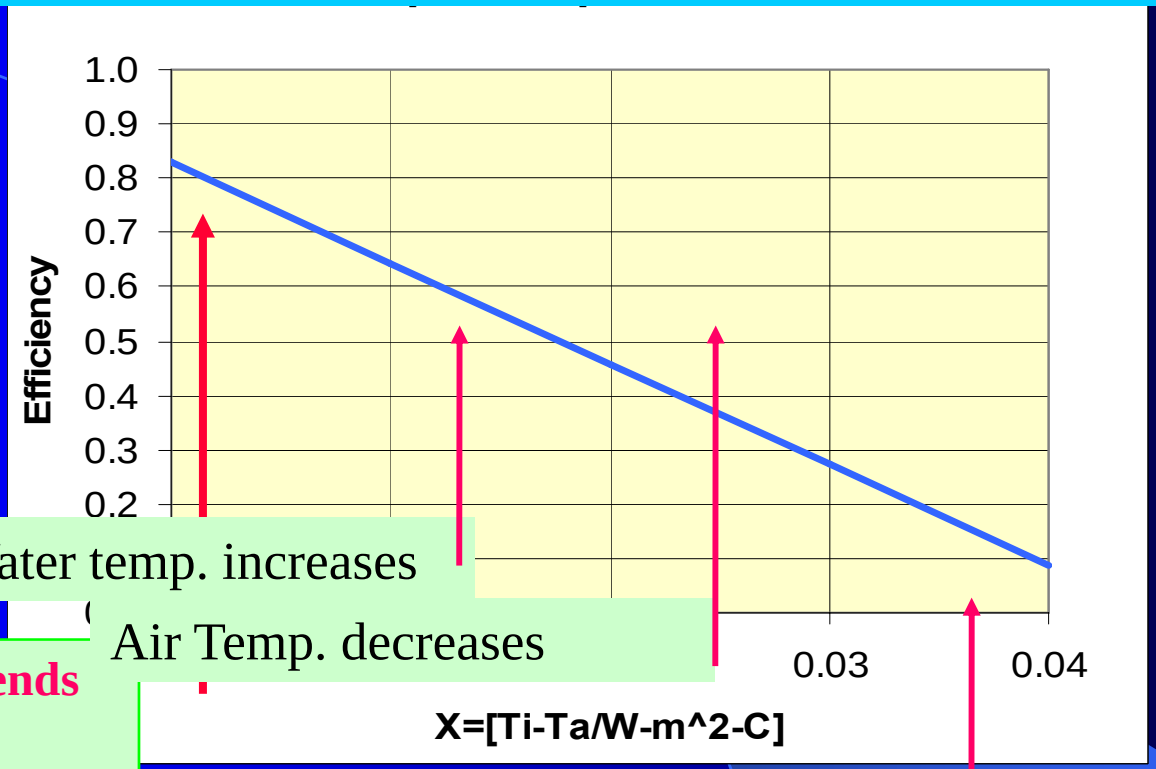
And even more:

- Modular design- **panels are produced in multiples of the basic unit.**
- Safe operation under weather extremes.
- Corrosion proof- **no scale and salt built-up in collector tubes**
- Variety of fittings for different applications.
- Choice of Colors: **Terra Cotta** panels **to blend beautifully with tile roofs.**
- Individual tube design: **eliminates wind load, allows your roof to breath and easy to repair!**
- Full 10 years warranty!

How do solar collectors work?



Collector's Efficiency: The rate of solar radiation transferred to the water.



Water temp. increases

Air Temp. decreases

Radiation decreases

Efficiency depends on:

1. Radiation
2. Water temp.
3. Temp.of ambiance

Important factors for planning a solar system:

- Enough space for collectors lay-out : roof/space exposed to direct sun radiation all day long.
- Recommended inclination: South, South-East.
- Heat Loss: Pool's floating or other transparent cover .
- Geographical location: North/South, Wind velocity, shade on the roof….

For example:(for those who need to see figures and formulas…)

- Open 60 ³ liter pool — V = 60m³
- We want to heat the pool in May to 27-28 º. — Ti= 28 C
- Average daily heat loss – approx. 3 º.C — C ΔT = 3

- Average energy required — Q = mcΔT = 60,000*3 = 180,000 kcal

- Details of climate In May :
  1 Daily average temp. 21.4º C — Ta= C
- 2. Average radiation on horizontal area — I = 5951 kcal/m²

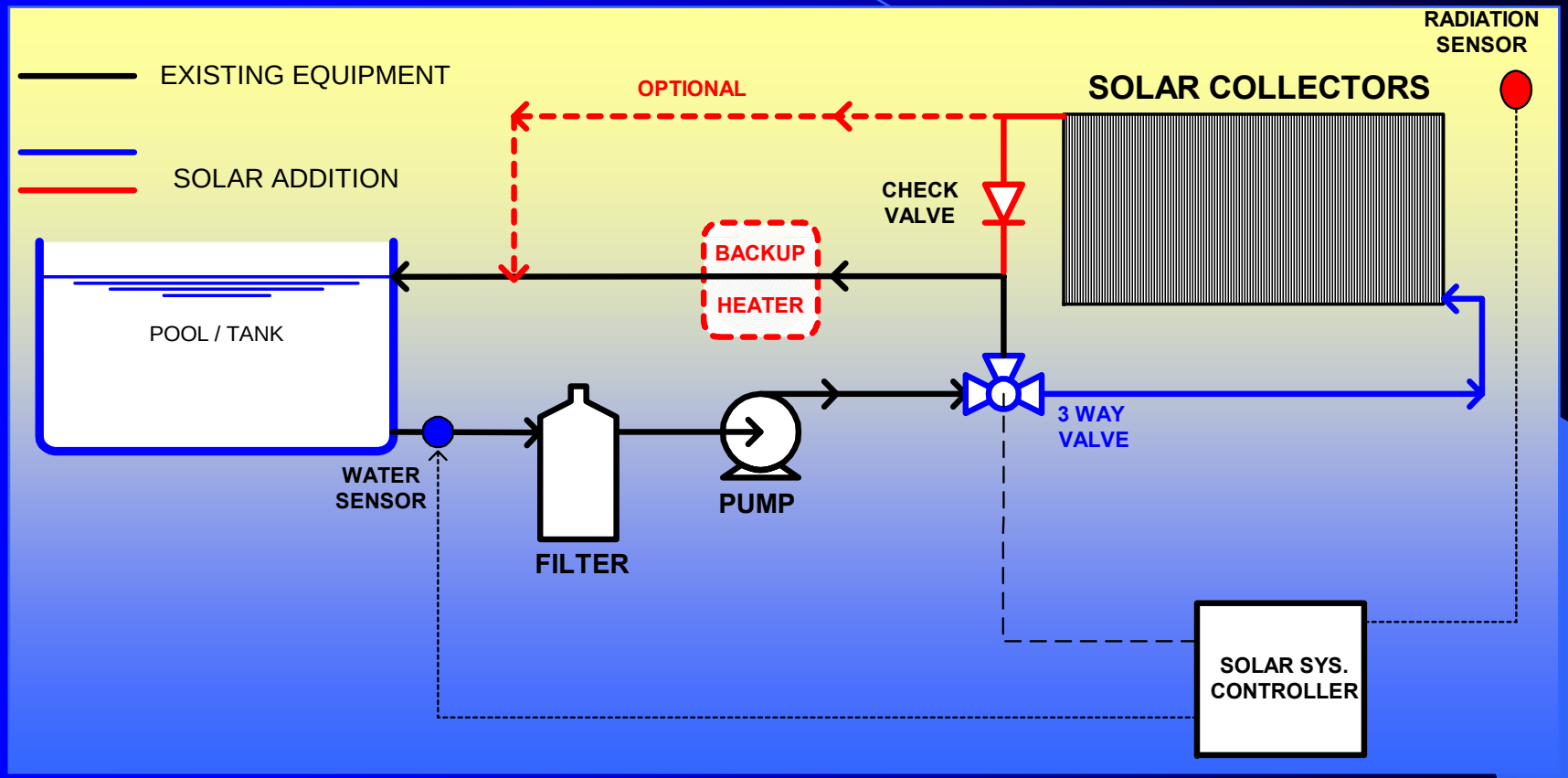
- The efficiency of the above data will therefor be — η= 72%
- Collectors area will provide each day q=η*I= Eff.* Rad = 0.72*5951 = 4284 kcal/m²

- Assuming the system has general heat loss in pipes = -20% in efficiency rate

- Therefore, the total area of **collectors** will be A= Q/q= 180,000/(0.8*4284)= 52 m²

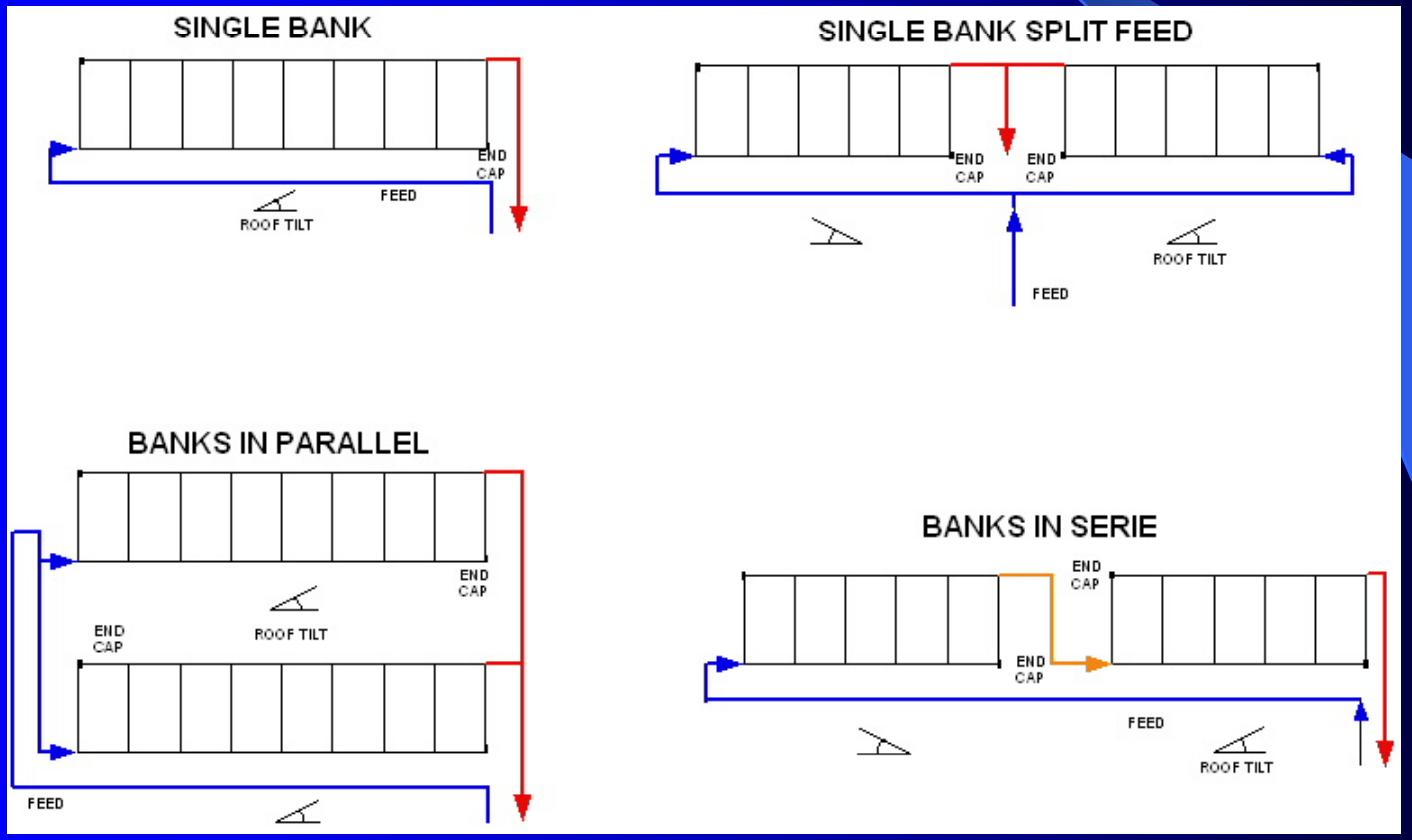
- For better indication let's assume that the pool depth is 1.1m. It's area will be 54m²
- **Absorption area is almost the same as pool area.**

Operation Chart



Water flow and Solar radiation

- For maximal sun absorption –horizontal and balanced flow of water is required throughout the entire system.



Working Capacity

- Working capacity of 1 SUNSTAR panel 0-7-1.1 m^3/h. (0.25 m^3/h, per m^2)
- 52 m^2 absorption area requires an average capacity of 13 m^3/h.
- (too) **Slow flow** in the collector will effect it's optimal capacity!
- (too) **Fast flow** in collector will create high head loss!

A system for a semi Olympic pool

A system for an Olympic pool(1900 sq.m) – Mexico City IMSS

Working Pressures

- The majority factor in pressure loss for solar systems is “lifting”the water from the pool to the roof. Additional factors are: length of pipes, angles, valves and the collectors themselves.

An independent pool pump?… Points to consider:

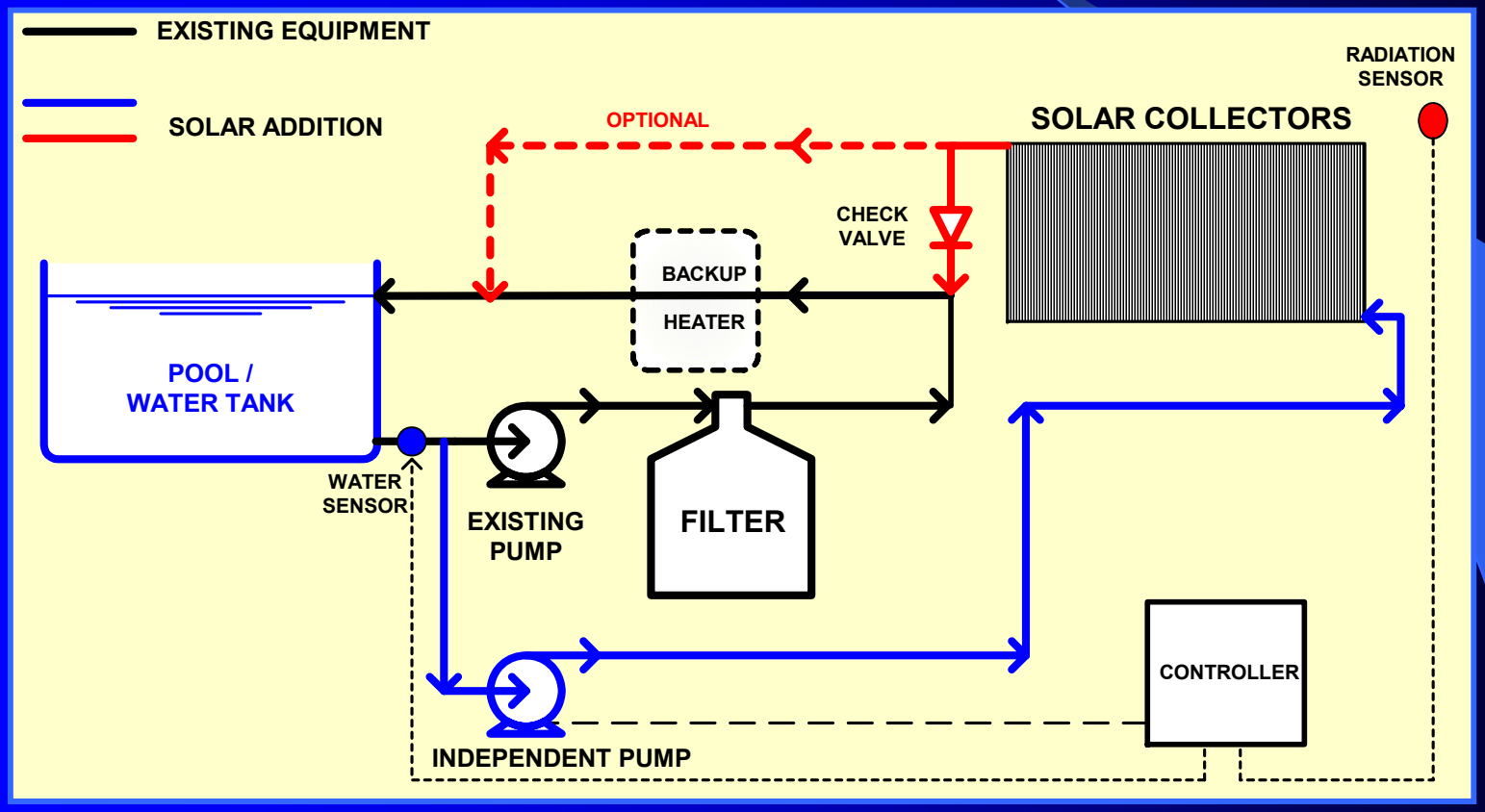
- Existing pool filtration capacity and the filter’s resistance when loaded.
- Collector’s height Vs. pump house location.
- Distance and curves between collectors and pump house.
- Controlling separate systems (in public pools).

Private pools

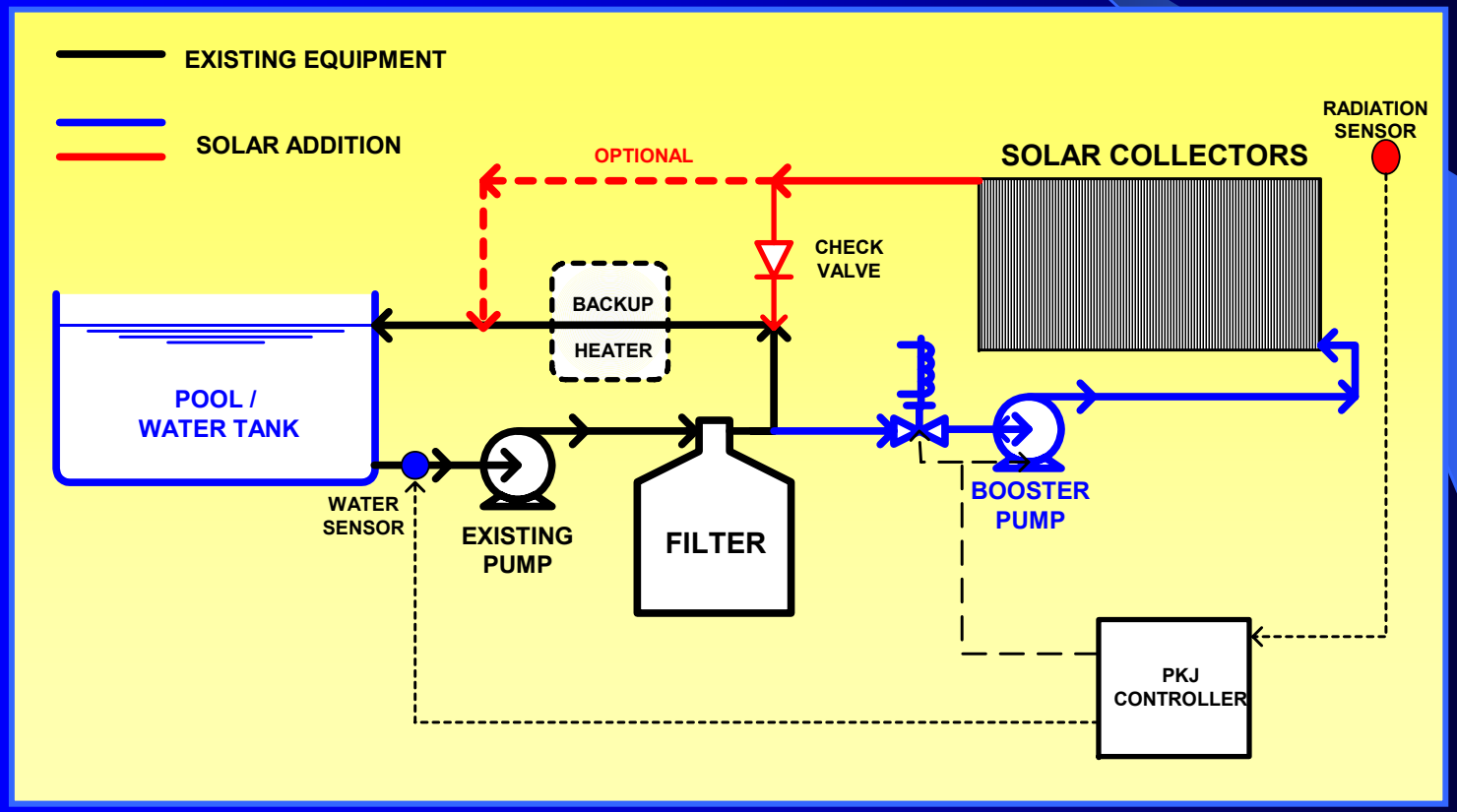
Hotel pools

13 years old SUNSTAR panels! Still “fresh…”

System with an independent pump



BOOSTER PUMP



“SUNSTAR” is offered by “SOLE S.A.”, one of the world’s leader manufacturer of solar thermal systems.

For more details please visit our web site at:

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