

SMART +
SUSTAINABLE

FACULTAD DE
INGENIERÍA Y CIENCIAS



Liderar la construcción **de un mundo sostenible**

¿Cómo funciona un panel solar?

Red EducaSostenible

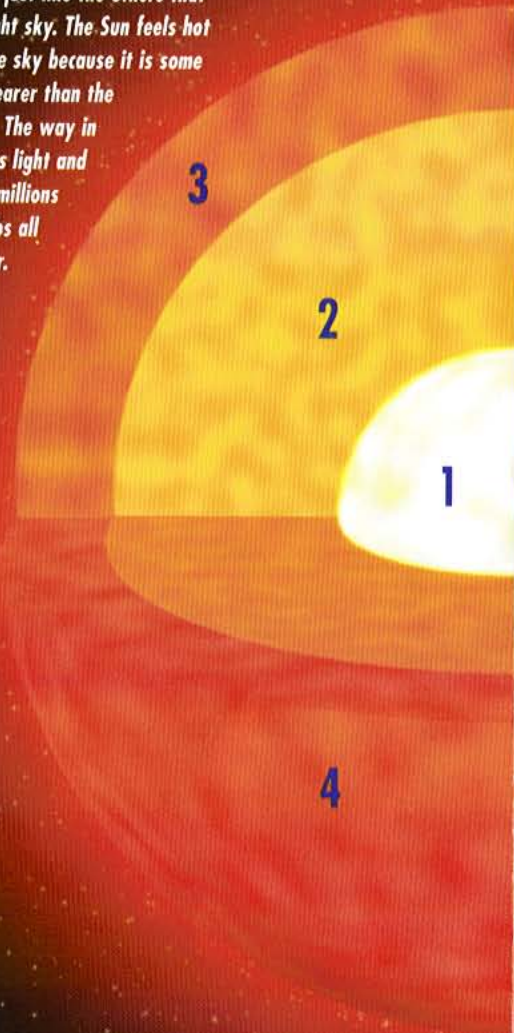
Felipe A. Larraín, PhD

Profesor Asistente, Facultad de Ingeniería y Ciencias

12 de Agosto de 2021

INSIDE THE SUN

The Sun is a star, just like the others that twinkle in the night sky. The Sun feels hot and dominates the sky because it is some 250,000 times nearer than the next closest star. The way in which it generates light and heat is a bit like millions of hydrogen bombs all going off together.



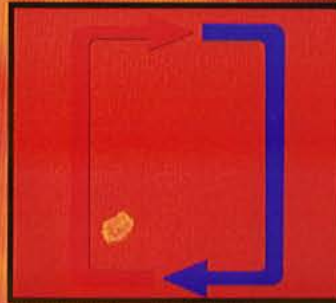
1 IN THE CORE

Pairs of hydrogen atoms combine to form helium atoms in a process known as *nuclear fusion*. During the process, matter is destroyed and energy given off. The amount of energy generated is given by Einstein's famous equation $E=mc^2$ (energy = mass x the speed of light x the speed of light). The numbers are enormous, as is the amount of energy generated!



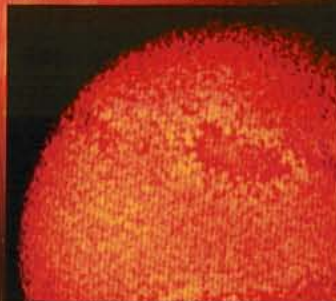
2 RADIATIVE ZONE

The matter near the center of the Sun is so densely packed that energy-carrying photons produced during the nuclear reactions have trouble finding their way through. They bounce from particle to particle in a so-called "random walk pattern" through the radiative zone. Their path is so slow that it can take over a million years for a photon to find its way out.



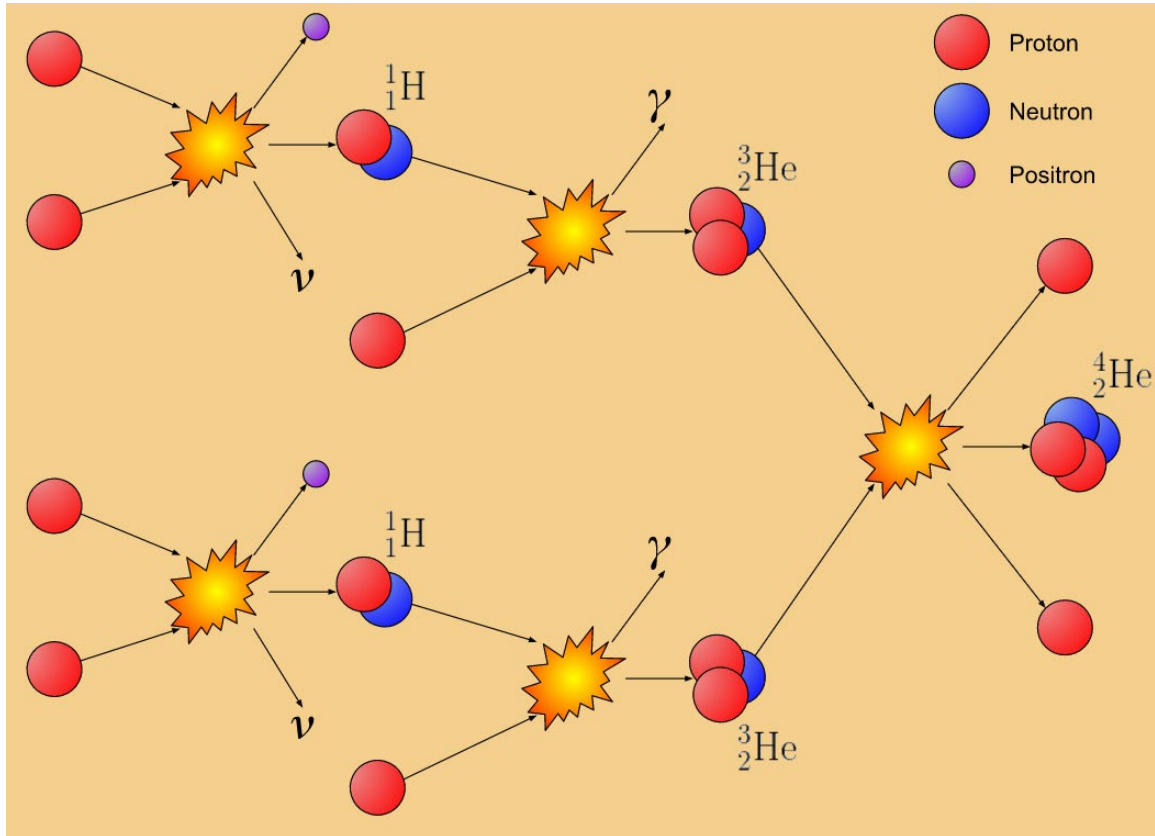
3 CONVECTION ZONE

Energy is carried from the radiative zone outward through the convective zone. Here, the hot gases boil up in giant convection cells rather like soup boiling in a pot—except that these "pots" are up to 20,000 miles across. The gases radiate the energy to the surface, then cool and sink down again, ready to pick up more energy.



4 PHOTOSPHERE

Here, smaller convection cells—up to 600 miles across—bubble up to the surface with more energy, giving the surface of the Sun a grainy appearance. The sunshine we see on Earth comes from the photosphere, which is the only part of the Sun we can see directly. The corona and flares are only visible during an eclipse.



¿Es esto poderoso?

1 gramo de hidrógeno fusionado en 1 gramo de helio libera 0.007 gramos de masa que se convierte en energía:

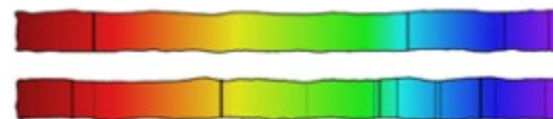
$$E=mc^2 \sim 6.3 \cdot 10^{11} \text{ J}$$

Suficiente para levantar 63,000 toneladas de roca a una distancia de 1 km sobre la superficie de la tierra.

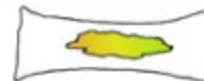
EL ESPECTRO ELECTROMAGNÉTICO

ESTAS ONDAS VIAJAN A TRAVÉS DEL ESPECTRO ELECTROMAGNÉTICO. ANTERIORMENTE ERAN PORTADAS POR EL ÉTER, QUE FUE RETIRADO DEL SERVICIO EN 1897 POR RECORTES DE PRESUPUESTO.

ESPECTRO DE ABSORCIÓN:



DODOTIS®:



TAMPAX®:



ROJO NARANJA AMARILLO VERDE AZUL VIOLETA



LUZ VISIBLE

OTRAS ONDAS:

ONDAS SLINKY

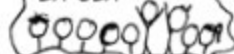


ONDAS SONORAS



ESE SONIDO AGUDO DE LAS HABITACIONES VACÍAS.

LA OLA



ANUNCIOS RUIDOSOS DE VENTA DE COCHES

CIA (SECRETO)

RADIO-AFICION

KOSHER RADIO

RAYOS ESPACIALES QUE CONTROLAN A STEVE BALLMER

AM (US)

CAMPANAS DE RECALEFACCIÓN DE LA NPR

VHF

UHF

FHF

WIFI

ONDAS CEREBRALES

SULAWESI

99.3 "LA FOX"

101.5 "EL TETÓN"

106.3 "LA ARDILLA ASUSTADA"

RAYOS CANCERÍGENOS DE LOS TELÉFONOS MÓVILES

ALIENS

SETI

GRAVEDAD

VISION DE CALOR DE SUPERMAN

LUZ DEL SOL

LÁSER DE LA ESTRELLA DE LA MUERTE PRINCIPAL

CENSURADO POR LA PATRIOT ACT

VISION DE CALOR DE JACK BLACK

LUZ DE MILLER

RAYOS X

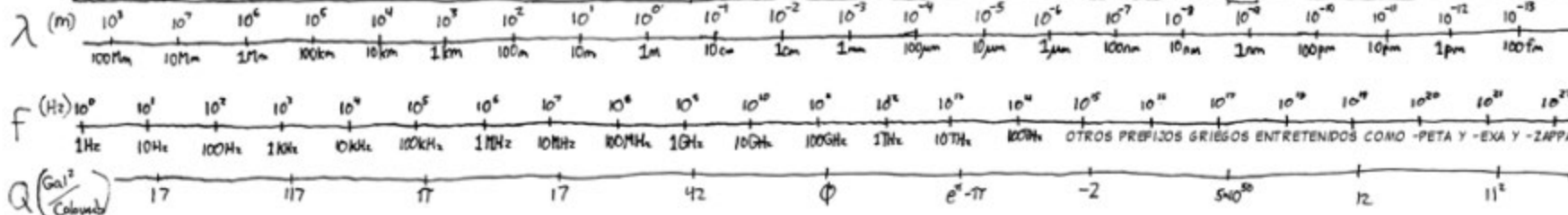
RAYOS CÓSMICOS/GAMMA

PATATA

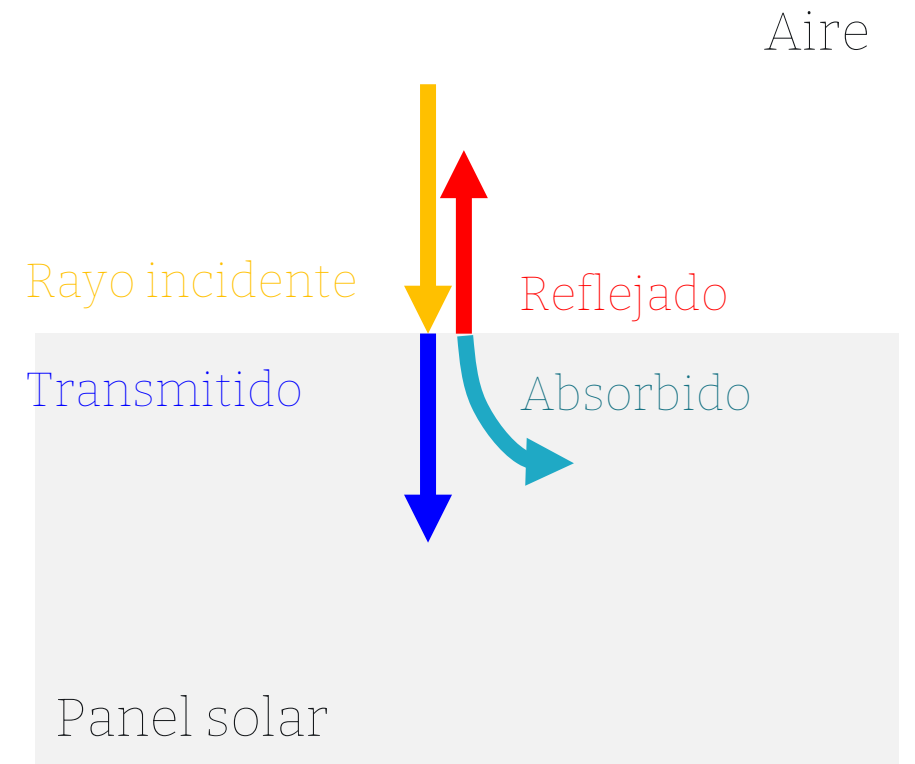
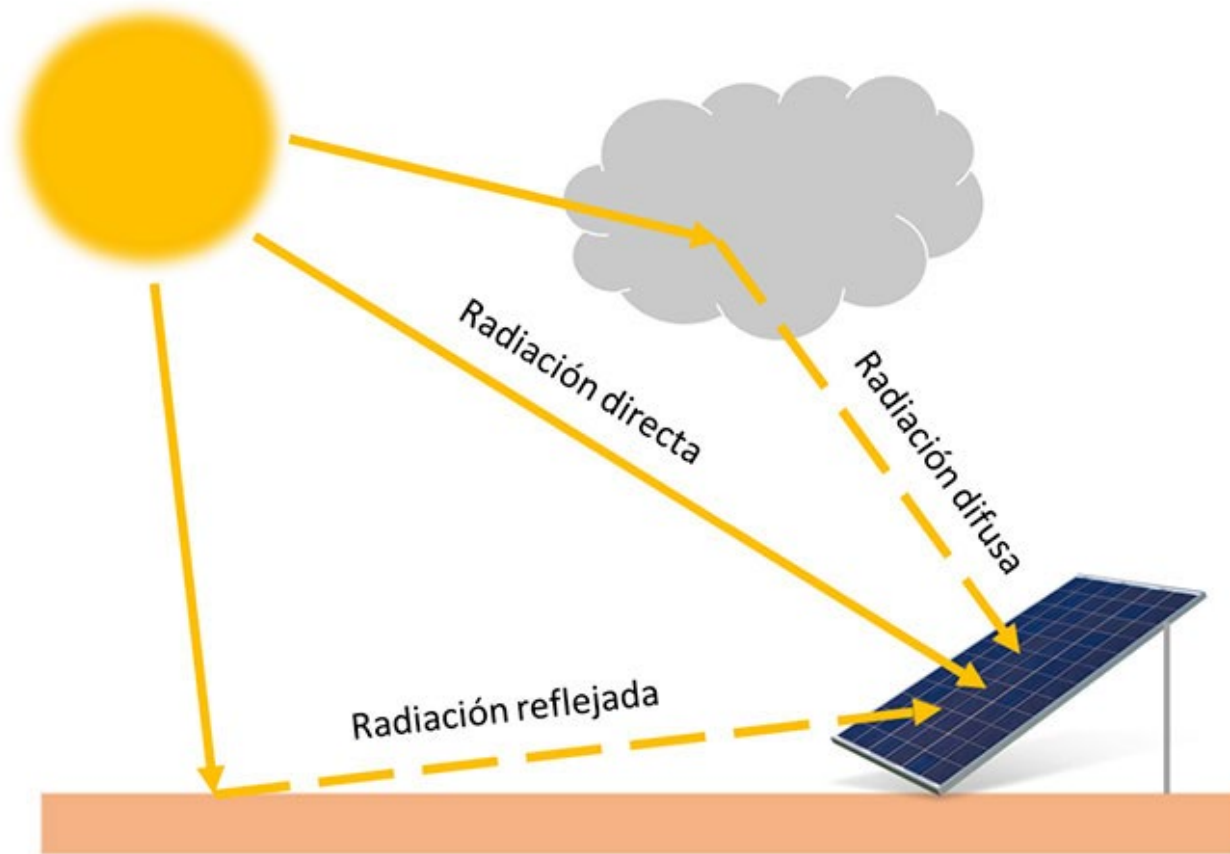
BLOGORAYOS

GAFAS DE RAYOS X DE LA TELETIENDA

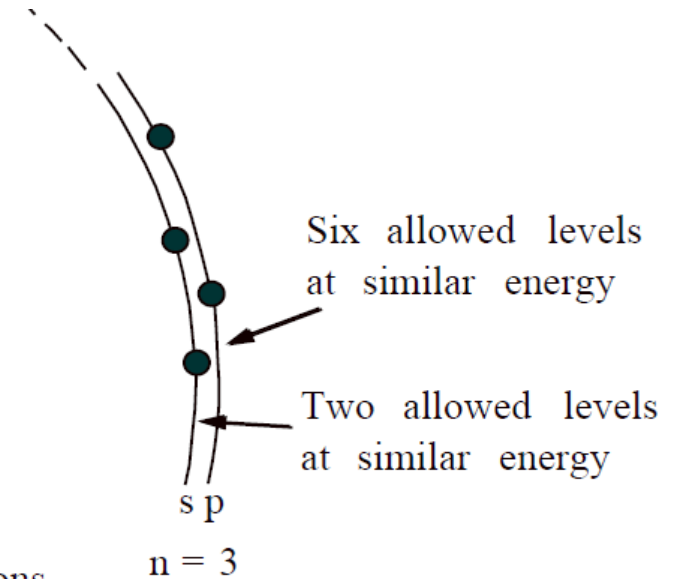
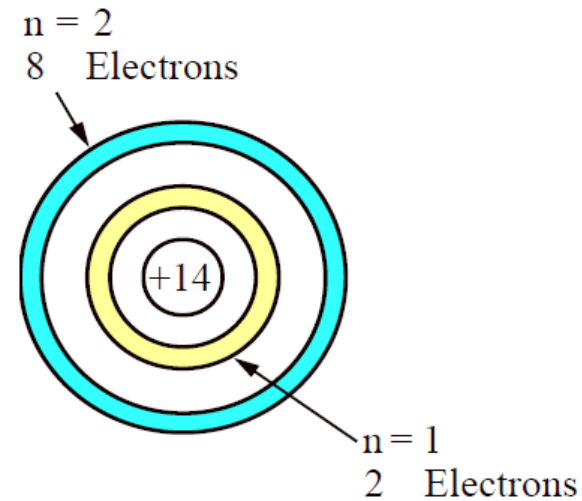
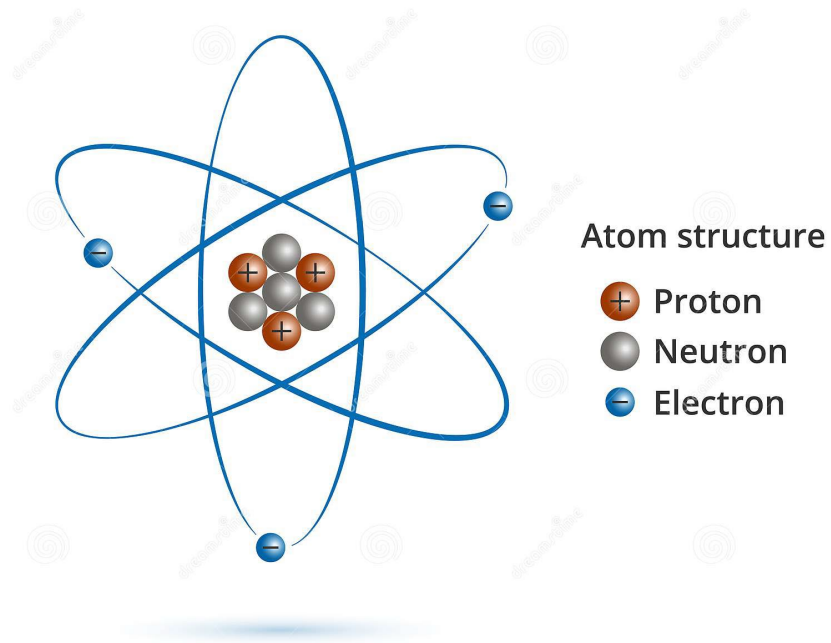
PROYECTOS SINISTROS DE GOOGLE



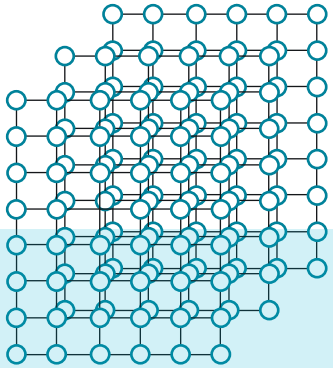
Desde el sol y hacia el panel



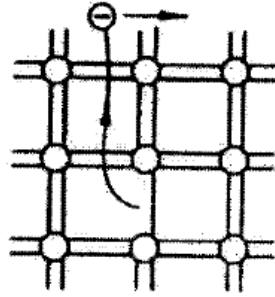
El modelo más sencillo de átomos se compone de un núcleo cargado positivamente, rodeado de electrones que orbitan el núcleo.



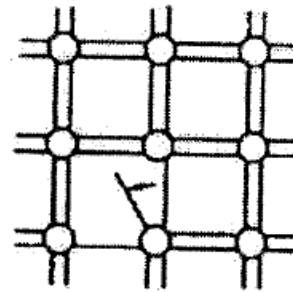
Promoción de cargas eléctricas



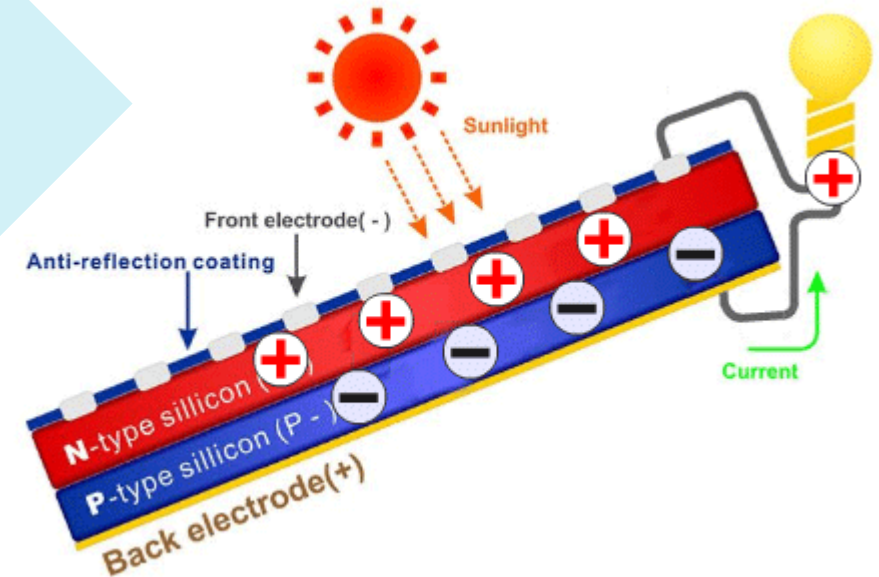
Entramado cristalino
de un panel solar



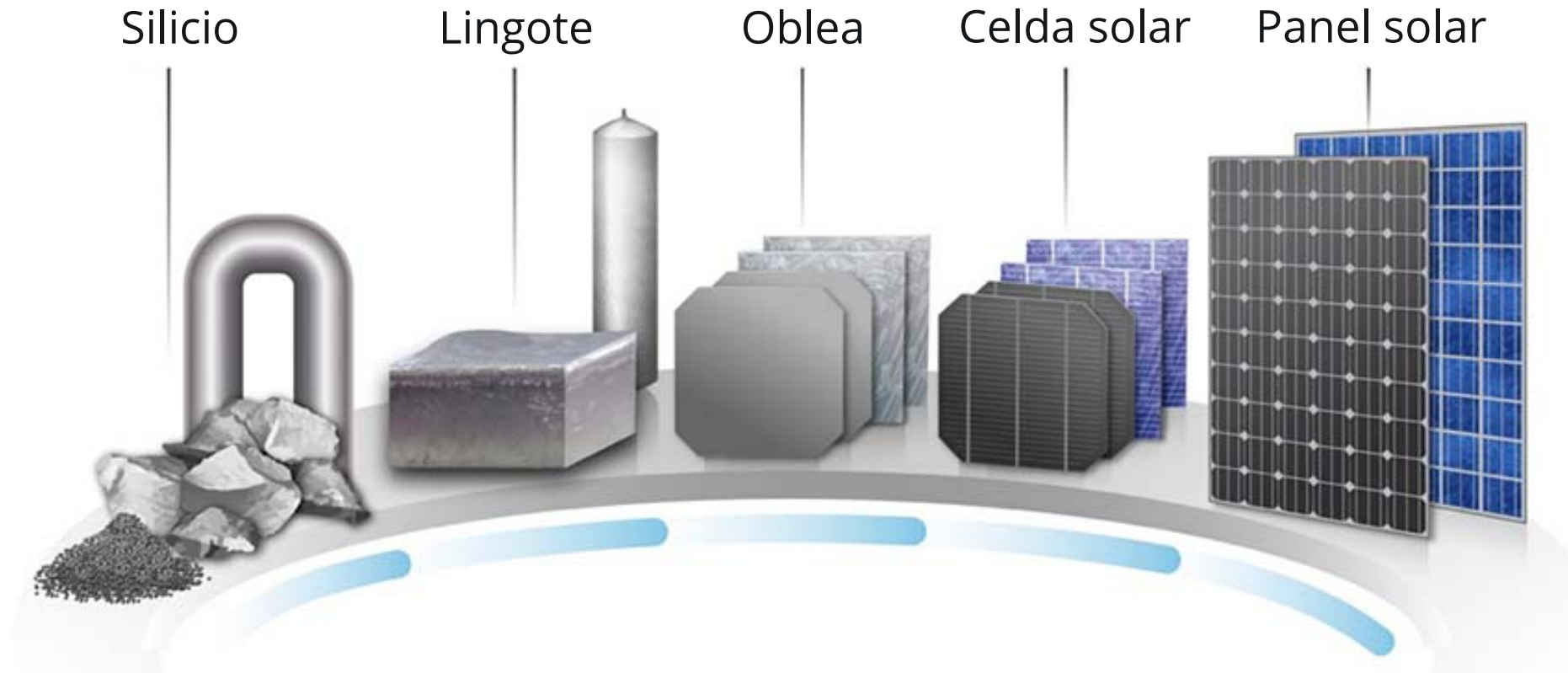
“Liberación” de un electrón



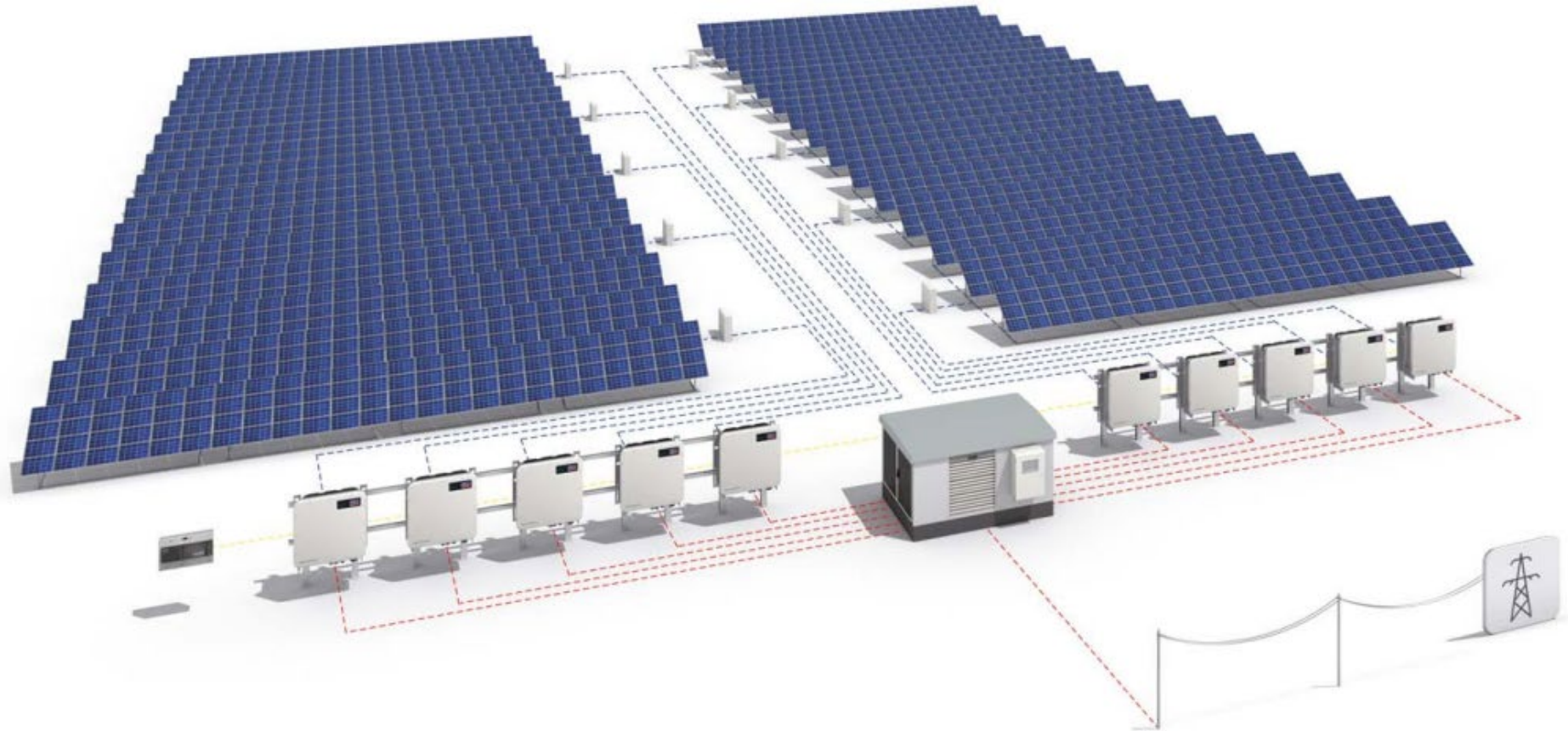
“Liberación” de un hueco



La cadena de valor de paneles solares



Componentes de una central solar



1. Paneles solares fotovoltaicos

2. Cableado y protecciones en DC

3. Estructuras de montaje / seguimiento

4. Inversores de potencia

5. Transformadores, cableado e inf. AC

6. Otra infraestructura en planta

Otras tecnologías solares fotovoltaicas



Orgánicos e híbridos



Récord de eficiencia 18+%



