

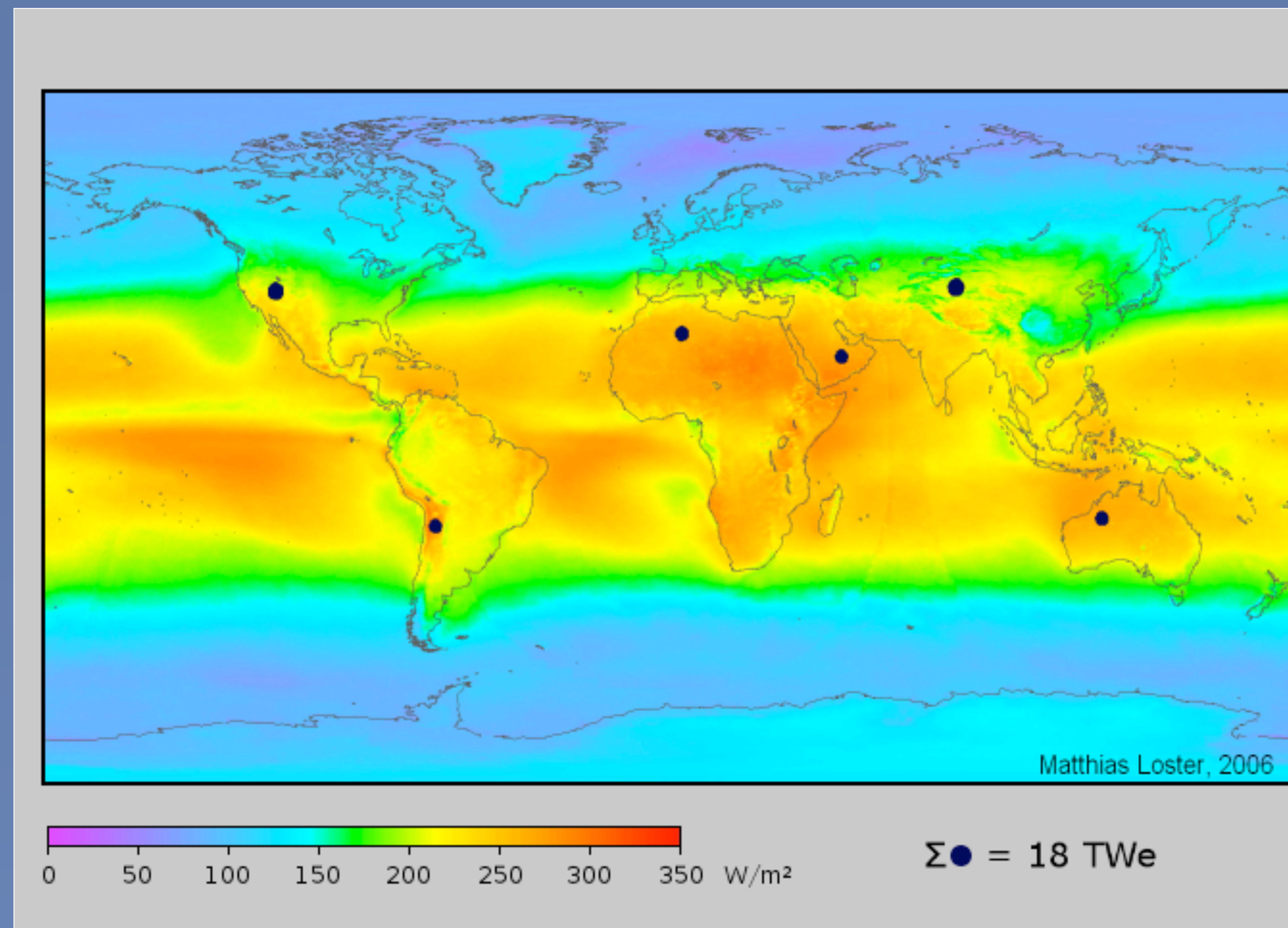
Solar Energy - The Future is Now!

Solar energy is derived from sunlight. This is an abundant power source that will remain for billions of years. Solar energy can be captured and converted in different ways, including:

- 1) Photovoltaics convert light to electrical energy
- 2) Solar-thermal structures convert light to heat energy
- 3) Photoelectrochemical cells convert light to chemical energy

The technology for solar energy utilization is available now, and undergoing improvement. Manufacturing costs have dropped dramatically. Photovoltaic cells can be produced for \$1/watt (capacity), and this value is falling. Solar-thermal heaters are low-cost, highly efficient, and often the most cost-effective way to heat water. [information about solar water heating can be found at the Energy Efficiency and Renewable Energy division, U.S. Department of Energy (http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12850)]

The amount of power that the Sun continuously delivers to Earth is approximately 120,000 Terawatts (TW = 1 trillion watts). Power consumption by humans in 2008 is 15 TW. The amount of solar energy is truly vast: solar energy reaching the Earth during over a 5.5 day period is equal to the energy stored in ALL of the oil reserves on Earth!



The figure above is a color coded map of the distribution of power density from sunlight. Equatorial and tropical regions have the highest average continuous power density. The average value on the surface of the earth is 200 Watts per square meter. This is a time averaged value that accounts for day/night and weather cycles. The black dots indicate the land area required to produce 18 TW of power from photovoltaics with 8% operating efficiency. Current technology is well above this value.

Is it economical to build solar? YES!

Consider a \$10 billion investment in an energy facility:

Oil refinery:
400,000 barrel/day
= 28 GW energy facility
Cost per barrel = \$100
Cost of oil per day = \$40 million

Major Pollution Source
Carbon dioxide (global warming)

http://www.eia.doe.gov/kids/energyfacts/science/energy_calculator.html

Solar (photovoltaics):
\$1/Watt
= 10 GW energy facility
(average continuous power production ~ 1.7 GW)
Cost of sunlight = \$0

No Pollution
No carbon dioxide

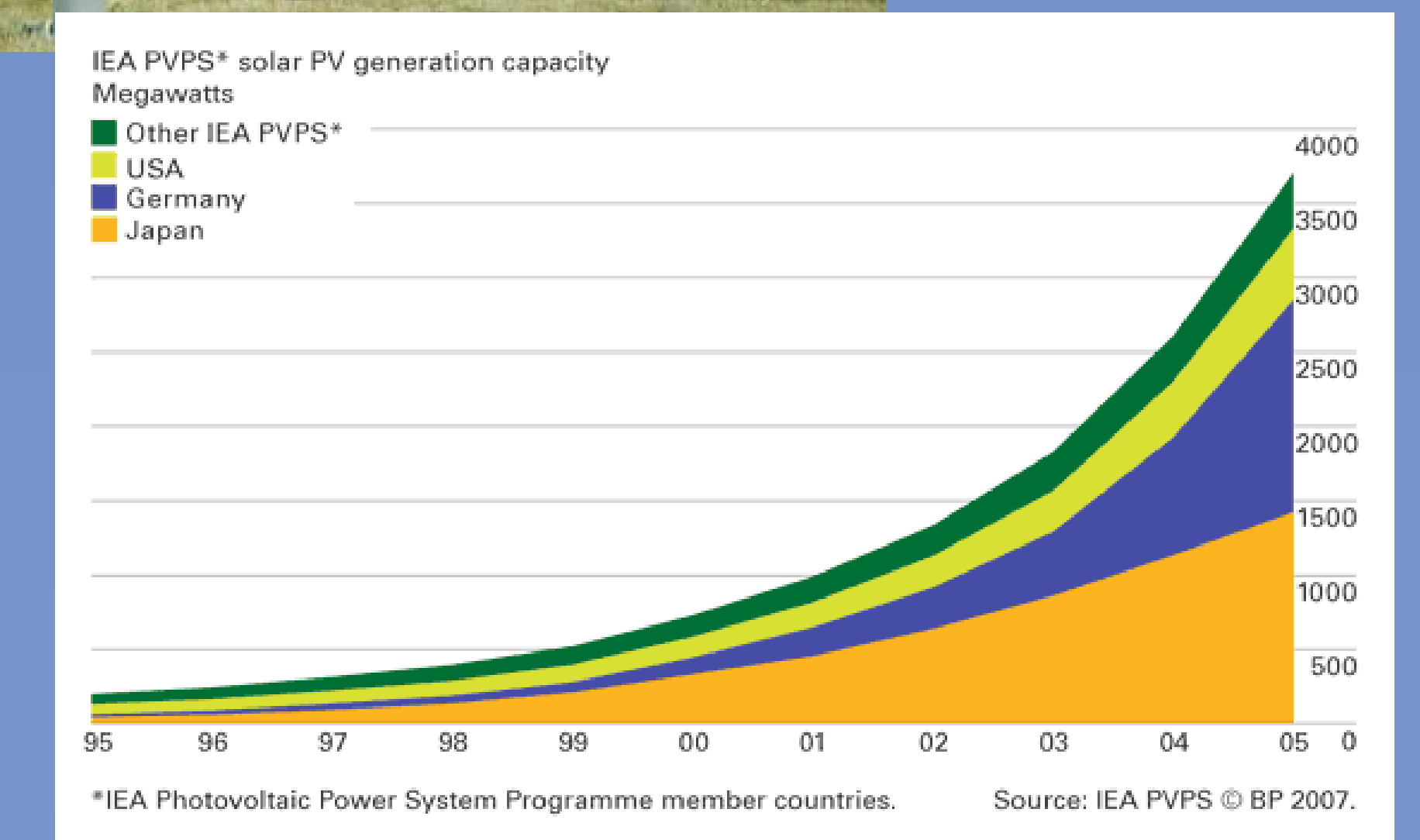
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The savings of \$40 million/day on the solar farm would allow a second \$10 billion investment each following year in solar energy! Following this formula, in 32 years, the production of power from photovoltaics would overtake the constant power production from the refinery. All of the energy from solar would be clean.

World's Largest Photovoltaic Power Plants

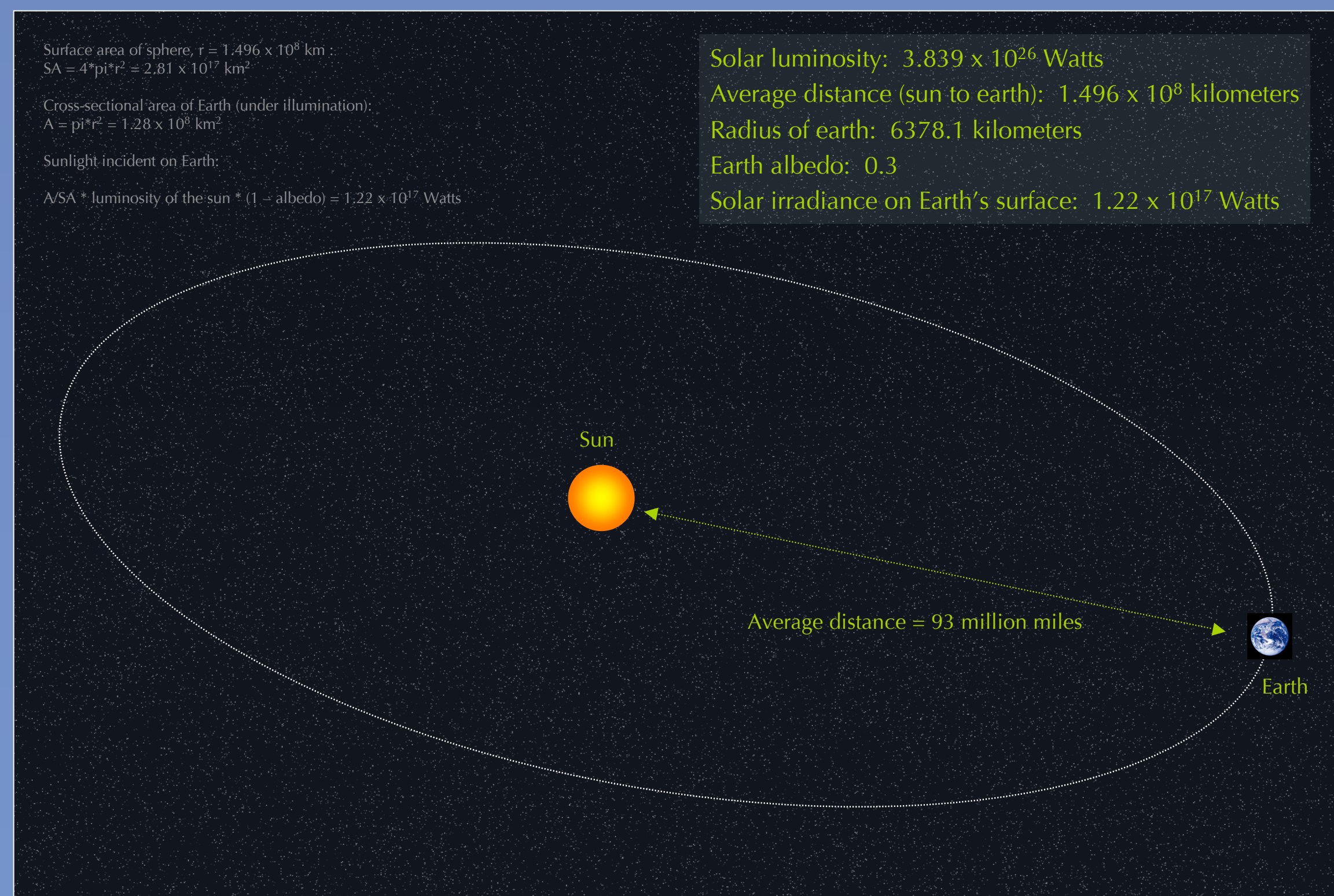
Power	Location	Photo
23 MW	Spain, Hoya de los Vincentes	
21 MW	Spain, Calaveron	
20 MW	Spain, Trujillo	
20 MW	Spain, Beneixama	
17.25 MW	Germany, Brandis	
14 MW	USA, Nellis, NV	
13.8 MW	Spain, Salamanca	
12.7 MW	Spain, Lobosillo	
12 MW	Germany, Eriasse/Arnstein	
11 MW	Portugal, Serpa	

<http://www.pvresources.com/en/top50pv.php>



Rapid growth in PV capacity continued in 2005. Growth rate of 42% in 2005 was the second highest in more than a decade; after the 45% growth in 2004. Ten-year average annual growth rate was 31%. As with wind, installed PV capacity has increased dramatically over the last decade. The increase was more than 18 fold, albeit from a much lower base than wind capacity. Solar energy is heavily subsidized as well.

A Gigantic nuclear fusion reactor continuously supplying energy to the Earth, safely kept millions of miles away...



Fate of sunlight on Earth

The illustration (NASA) contains figures for the distribution of solar energy striking the earth. 1 PW (petawatt) = one thousand trillion watts (10¹⁵)

