

**Renewable Energies –  
Theme for Underground and Surface Construction  
Erneuerbare Energien – Themen für das unterirdische und überirdische Bauen**

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**Abstract / Kurzfassung**

Renewable energy is the form of energy source which originated from natural resources. These natural resources are sun/solar energy (heating, light), maritime energy (waves, tides), wind energy, geothermal energy, biomass energy (fuel wood, agricultural residues, animal wastes, charcoal, ethanol fuel, etc.), which are naturally replenished. In contrast to this forms of energy sources other energy sources, which originate from natural resources too, like oil, gas, coal, uranium, etc., are not renewable energy sources, because they are not naturally replenished. In global energy consumption the part of renewable energy in electricity generation is estimated around 20 per centum. Moreover, renewable energy has the potential to obtain an important role in providing energy with sustainability to the vast populations in developing countries whom to this date have no access to clean energy. Given that many renewable energy projects are at large-scale, underground and/or surface construction engineering become a crucial issue. Wind power, as an example of renewable energy, is the conversion of wind energy into more useful forms of energy, such as using wind turbines for electricity generation, wind mills for mechanical power, or wind pumps for pumping water or drainage. Wind power is growing at a calculated rate of 30 per centum annually, with a worldwide installed capacity of approximately 160 Giga Watts in 2009. Wind power meets the world's growing demand for green energy. Despite differences in turbine design and size, most wind farms construction planning show similar characteristics. In particular, surface construction engineering site works such as access roads and grid connection, as well as underground construction engineering works like conduits and foundations for substations that are common to all large scale wind farms worldwide. Compared to wind energy, geothermal energy is generated and stored in the Earth, originating from the planets formation, such as radioactive decay of minerals, volcanic activity, and solar energy absorbed at the surface. In geothermal energy, the gradient, which is the difference in temperature between the core of the planet and its surface, drives a continuous conduction of thermal energy in the form of heat from the core to the surface. The world's largest geothermal power installation is "The Geysers" in California, with an estimated geothermal power of 750 MW. Moreover, geothermal electricity can be generated from geothermal energy, using dry steam power plants, flash steam power plants and binary cycle power plants technology. Geothermal electricity generation is currently used in 24 countries. Despite differences in power plant technology, geothermal electricity plants construction planning show similar characteristics. Underground construction engineering works deals with drilling in deep depth like more than 3km. The technological challenges in underground construction engineering are to drill wide bores at low cost and to break larger volumes of rock. In comparison to wind and geothermal energy solar powered electrical generation relies on heat engines and photovoltaic's. A partial list of solar applications includes space heating and cooling through solar architecture, potable water via distillation and disinfection, day lighting, solar hot water, solar cooking, and high temperature process heat for industrial purposes. To attain the solar energy, the most common way is to use solar panels. Despite differences in solar panels technology, solar energy plants construction planning show similar characteristics in surface construction engineering.