



**ALTERNATIVE ENERGIES — ENERGY ALTERNATIVES**



# **SOLAR ENERGY**

- ✓ **RADIATION FROM THE SUN PRODUCE HEAT, GENERATE ELECTRICITY, OR CAUSE CHEMICAL REACTIONS**
- ✓ **SOLAR COLLECTORS COLLECT SOLAR RADIATION AND TRANSFER IT AS HEAT TO A CARRIER FLUID**
- ✓ **SOLAR CELLS CONVERT SOLAR RADIATION DIRECTLY INTO ELECTRICITY BY MEANS OF THE PHOTOVOLTAIC EFFECT**
- ✓ **SOLAR ENERGY IS INEXHAUSTIBLE AND NONPOLLUTING**
- ✓ **INHERENT INEFFICIENCY IN CONVERTING LIGHT TO ELECTRICITY**







# WIND POWER

- ✓ **ELECTRICITY PRODUCED BY TURBINES USING THE ENERGY IN WINDS**
- ✓ **INDIRECT FORM OF SOLAR ENERGY (SUN UNEVENLY HEATS DIFFERENT AREAS)**
- ✓ **HORIZONTAL – VERTICAL AXIS TURBINES**
- ✓ **WIND IS IRREGULAR AND SPREAD OUT, BUT CONTAINS TREMENDOUS AMOUNTS OF ENERGY**
- ✓ **WIND POWER IS INEXHAUSTIBLE AND NONPOLLUTING**
- ✓ **SMALL WIND - UTILITY-SCALE WIND - OFFSHORE WIND**





# HYDROPOWER

- ✓ **BY MOVING WATER TO SPIN TURBINES AND GENERATE ELECTRICITY**
- ✓ **WATER TURBINES CONVERT THE ENERGY IN FALLING OR FAST-FLOWING WATER TO MECHANICAL ENERGY**
- ✓ **WATER AT A HIGHER ELEVATION FLOWS DOWNWARD THROUGH LARGE PIPES OR TUNNELS (PENSTOCKS)**
- ✓ **STORAGE HP - PUMPED STORAGE HP - RUN-OF-RIVER HYDROPOWER**
- ✓ **TIDAL POWER , WAVE ENERGY - GRAVITATIONAL PULL OF THE MOON AND WIND BLOWING**







# **GEO THERMAL**

- ✓ **HEAT WITHIN THE EARTH**
  - ✓ **ORIGINAL FORMATION OF THE PLANET**
  - ✓ **CONTINUOUS RADIOACTIVE DECAY OF MATERIALS IN ROCKS**
- ✓ **WATER OR STEAM CAN CARRY HEAT ENERGY TO THE SURFACE**
- ✓ **HIGH – MIDDLE - LOW TEMPERATURE RESERVOIRS**
- ✓ **DIRECT HEATING – ELECTRICITY GENERATION – HEAT PUMPS**
- ✓ **LOCATION DEPENDENT – HIGH INITIAL COSTS – SURFACE INSTABILITY**





# BIOMASS

- ✓ **ORGANIC PLANT OR ANIMAL MATTER CAN BE USED TO GENERATE ENERGY**
- ✓ **AGRICULTURAL CROPS, TREES, GARBAGE, ALGAE, ANIMAL MANURE, AND HUMAN WASTE**
- ✓ **BEING BURNED DIRECTLY FOR HEAT**
- ✓ **CONVERTED INTO GASES OR LIQUIDS FOR BURNING AND/OR ELECTRICITY GENERATION**
- ✓ **BY BURNING FROM CARBOHYDRATES TO  $\text{CO}_2 + \text{H}_2\text{O} + \text{ENERGY}$  (CAPTURED FROM THE SUN)**
- ✓ **ELECTRICITY BY BURNING, CONVERTING BIOMASS TO FUEL, BACTERIAL DECOMPOSITION**

