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Integration of renewable energy sources involves integrating in a system any energy resource that naturally regenerates over a short period of time. This time scale is derived directly from the sun (such as for thermal, photochemical, and photoelectric energy), indirectly from the sun (such as for wind, hydropower, and photosynthetic energy stored in biomass), or from other natural movements and mechanisms of environment (such as for geothermal and tidal energy). A renewable energy source cannot run out and causes so little damage to the environment that its use does not need to be restricted.

Today, the world's energy supply is based largely on fossil fuels and nuclear power. These sources of energy will not last forever and have proved to be a major cause of environmental problems. In less than three centuries since the industrial revolution, humankind has burned away roughly half of the fossil fuels accumulated under Earth's surface during hundreds of millions years. Now as fossil fuels become more expensive and less abundant, and concerning increase of the dangerous influence of their products, alternative sources are more attractive.

The technology for diversified energy has long been available, but the rising costs and decreasing supplies of fossil fuels and concerns about man's role in climate change, environmental degradation have made renewable sources of energy more economically and ecologically viable.

Reducing dependence on fossil fuels can not only significantly stem the global climate distress, it will also act as an agent of recovery for an ailing global economy. Rebuilding the global energy system has the potential to create thousands of new businesses and millions of new jobs, starting immediately.

Adoption of alternative energy technologies requires several key steps: the accelerated deployment of solar, wind, and biomass power plants; integrating variable power sources with digital smart grids that are more flexible in their ability to balance demand and supply; developing the capacity to store energy economically; and selectively adding a new generation of efficient micro power plants that provide heat as well as reliable electricity when it is needed.

Hydropower is one of most established true renewable energy source. This is the utilization of the potential energy caused by a height different in two levels of electricity. Originally this was used in old fashioned water mills, however in the first half of the 20th century more modern devices using turbines to generate electricity were used.

Wind power depends on utilizing the wind to generate electricity or carry out some other activity, such as pumping water. As with many other natural energy sources it has a history going back quite centuries. Windmills were used to help grind corn, and wind power was used to pump water. In many areas of the world wind power is now able to compete with all other forms of generation even without any form of government assistance, and so this is at present the renewable energy source which is adding most capacity each year.

Solar electric relies on the power of the sun to generate "clean" electricity through a variety of mediums. There are a series of ways of converting a solar energy resource into electricity including photovoltaics, solar chimneys and concentrated solar power.

Biomass, generally in the form of wood and charcoal for heating, was used as the major primary source for the vast majority of human history. However, in the 19th and 20th centuries fossil fuels generally started to take over so that in most developed countries biomass became a contributor to the total energy mix. There has recently been increased interest in biomass as an energy source in the more developed countries for environmental reasons.

Tidal energy is a renewable energy source which utilizes the power of the tides. Tides are caused by the gravitational pull of the moon, and to a lesser extent the sun upon the earth's oceans. The tidal motions follow a cyclical pattern, and so unlike other forms of renewable energy such as wind and waves it is possible to predict with great accuracy the power output of a tidal energy device well in advance of it being placed within the water, which is a great bonus.

Ocean thermal energy conversion for short is a theoretical way of getting renewable energy out of the sea, by taking advantage of the temperature difference between surface seawater and deep seawater.

Geothermal are renewable energy sources which utilize the heat within the earth to create either a source of renewable heat or renewable electricity.

It is possible to get renewable energy from the waves, using a series of devices. Up until recently these devices were still at the prototype stage, but recently the first commercial wave energy devices have been deployed to usher in a new type of renewable energy technology. Most wave energy devices are used to generate renewable electricity, but there have been plans to use the energy to pump water.

The immediate challenge for the world's governments is to maintain the extraordinary momentum of the past few years in the face of a financial crisis that has affected all forms of energy investment. The new industries, which are dominated by small, under-capitalized companies, are particularly vulnerable. Their success will depend on targeted and flexible policy design in the future.

References

1. EREC (Integration of Renewable Energy Sources), Workshop on Renewable Energy Market Development Status and Prospects, April-May 2004.
2. F. A. Farret, M. Gody Simoes, Integration of alternative sources of energy, IEEE press, pp. 1-27, 2006