



Course: Sustainable Energy Technology 1
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Title: Renewable Energy Technologies- L2

Dr. Mahmoud Ismail

Renewable Energy Technologies

Energy demand and renewable energy

Many alternative energy sources can be used instead of fossil fuels.

The decision as to what type of energy source should be utilized in each case must be made on the basis of economic, environmental, and safety considerations.

It is now generally believed that renewable energy technologies can meet much of the growing demand at prices that are equal to or lower than those usually forecast for conventional energy.

Moreover, making a transition to a renewable energy-intensive economy would provide environmental and other benefits not measured in standard economic terms.

Renewable Energy Technologies

Energy demand and renewable energy

A high rate of penetration by intermittent renewables without energy storage would be facilitated by emphasis on advanced natural gas-fired turbine power-generating systems.

Such power-generating systems are characterized by:

low capital cost, high thermodynamic efficiency,
and the flexibility to

vary electrical output quickly in response to changes in the output of intermittent power-generating Systems.

It would make it possible to backup the intermittent renewables at low cost, with little, if any, need for energy storage.

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Main Features of RE Future

1- There would be a diversity of energy sources. For example, electricity could be provided by various combinations of hydroelectric power, intermittent renewable power sources (wind, solar thermal electric, and photovoltaic (PV)), biomass, and geothermal sources.

Fuels could be provided by methanol, ethanol, hydrogen, and methane (biogas) derived from biomass, supplemented with hydrogen derived by electrolysis process from intermittent renewables

2- Emphasis would be given to the efficient mixing of renewable and conventional energy supplies.

3- Biomass would be widely used.

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Main Features of RE Future

4- Intermittent renewables would provide a large quantity of the total electricity requirements cost effectively, without the need for new electrical storage technologies.

5. Natural gas would play a major role in supporting the growth of a renewable energy industry.

low capital costs; quickly adjust their electrical output; can provide excellent backup for intermittent renewables on electric power grids.

6- May stabilize the world energy price.

7- Most electricity produced from renewable sources would be fed into large electrical grids and marketed by electric utilities, without the need for electrical storage.

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Problems that may decrease penetration of renewables

- To achieve high penetration of renewables, existing market conditions need to change.

Problems:

- Private companies are unlikely to make the investments necessary to develop renewable technologies because the benefits are distant and not easily captured.
- Private firms will not invest in large volumes of commercially available renewable energy technologies because renewable energy costs will usually not be significantly lower than the costs of conventional energy.
- The private sector will not invest in commercially available technologies to the extent justified by the external benefits that would arise from their widespread deployment.

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Policy initiatives to encourage innovation and investment in renewables

1. Remove subsidies that artificially reduce the price of fuels that compete with renewables
2. Taxes on pollution.
3. Increase government support for research, development, and demonstration of renewables.
4. Government regulations of electric utilities should be carefully prepared
5. Policies to encourage the development of the biofuels industry that coordinated with national agricultural development programs and efforts to restore degraded lands.
6. National institutions should be created to implement renewable programs.
7. Increase International development funds available for the energy sector .
8. Strong international institution should be created to assist and coordinate national and regional programs for increased use of renewables, support the assessment of energy options, and support centers of excellence in specialized areas of renewable energy research.

Meet KOYOTO PROTOCOLS target by(Renewables; Biofuels in transportation; Efficient energy use).

Fight climate change; boost energy security.

Renewable Energy Technologies

Energy-related environmental problems

Conventional pollutants are sulfur dioxide (SO₂), nitrogen oxides (NO_x), particulates, and carbon monoxide (CO).

Recently, however, environmental concern has extended to the control of hazardous air pollutants, which are usually toxic chemical substances harmful even in small doses, as well as to other globally significant pollutants such as carbon dioxide (CO₂).

Additionally, developments in industrial processes and structures have led to new environmental problems.

Carbon dioxide as a GHG plays a vital role in global warming.

Factors affecting future level of energy consumption and production.

population growth,

economic performance,

consumer behavior,

technological developments,

government policies concerning energy and developments