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RENEWABLE ENERGY RESOURCES NEED OF THE HOUR

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Abstract: The electricity requirements of the world including India are increasing at an alarming rate and the power demand has been running ahead of supply. It is now widely recognized that the fossil fuels (e.g. - coal, petroleum, natural gas) and other conventional resources, presently being used for generation of electric energy, may not be either sufficient or suitable to keep pace with ever increasing demand of electricity of the world. The recent severe energy crisis has forced the world to develop new methods of power generation. The magneto-hydro- dynamic (MHD) power generation is one of them. Other non- conventional methods of power generation is solar cells, fuel cells, solar power generation etc. Renewable Energy Resources (RER) are on the world agenda either because of security of energy supply or due to environmental reasons. However, share of RER is very low in the current world energy supply mix due to relatively high cost of RER technologies compared to conventional energy resources such as oil, coal or natural gas. Therefore, many countries try to promote use of RER in the primary energy supply mix either by using direct support policies such as Feed-in Tariffs (FIT) and Renewable Portfolio Standards (RPS) and financial incentives such as taxes, subsidies, or through indirect support mechanisms, namely environmental policy instruments i.e. carbon taxes and carbon permits. Generally, countries use mixture of these policy instruments simultaneously.

Keywords: Magneto-hydro- dynamic (MHD) power generation, Renewable Energy Resources (RER), Feed-in Tariffs (FIT), Renewable Portfolio Standards (RPS).

INTRODUCTION

Why we are going for non-conventional energy resources? Basically energy sources are of two types: - Conventional energy sources like coal, petroleum, natural gas etc. And non conventional energy sources like solar cells, fuel cells, wind power generation, tidal power generation etc.
Different Non-Conventional methods of power generation and their efficiencies:

S.NO	METHOD	EFFICIENCY	
		PRESENT	FUTURE
1.	MHD Power generation	50%	60%
2.	Thermo-electric power generation	3%	13%
3.	Thermionic converters	15%	40%
4.	Solar cells	15%	
5.	Fuel cell technologies	50%	60%
6.	Solar power generation	30%	50%
7.	Wind power generation	**30 %**	
8.	Geo-Thermal Power generation	**15%**	

CURRENT STATUS OF KNOWLEDGE AND RESULTS

From the previous table we conclude that fuel cell technologies have higher efficiency compared with other methods of electric power generation. Another reason for the interest in fuel cells is; cost per kW of power is independent of size (or rating) of the fuel cells. The other merits are as follows.

(a) MERITS OF FUEL CELLS:

1. The unit is lighter and smaller and requires little maintenance because of absence of mechanical parts
2. They cause little pollution and little noise.
3. No overhead line is required.
4. Fuel can be used more effectively than in a central power plant.
5. They can become remarkable home units.
6. High efficiency of about 50% compared to 30% of conventional power system

(b)TYPES OF FUEL CELLS:

The different types of fuel cells are as follows.

1. Alkaline Fuel Cells (AFC).
2. Proton Exchange Membrane Fuel Cells (PEMFC).

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3. Direct Methanol Fuel Cells (DMFC).
4. Phosphoric Acid Fuel Cells (PAFC).
5. Molten Carbonate Fuel Cells (MCFC) and Solid Oxide Fuel Cells (SOFC).

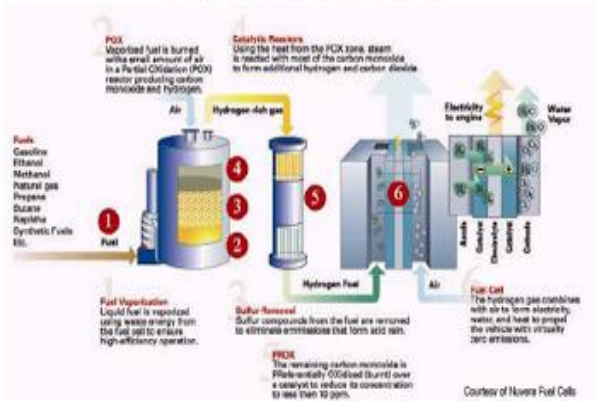
Among all these types the general type of fuel cell technology used is Proton Exchange Membrane Fuel Cells (PEMFC). So the following sections we will see the basic PEMFC, working and its applications etc.

(c) PROTON EXCHANGE MEMBRANE FUEL CELL (PEMFC)

The important application of the PEMFC is for automotive power because of low operating temperatures and hence can handle fast start-ups and transients as experienced in automotive applications. The PEMFC is also being considered for portable power, small-scale stationary power and UPS (uninterruptible power supplies). While the PEMFC was first used in the first Gemini Space flight to supply electric power and water to astronauts, the membrane was unstable and the PEMFC was discarded in favour of the Alkaline Fuel Cell in the succeeding space flights until Nafion was discovered in 1970s. The utilization of Nafion membrane has now extended PEMFC operating time up to 3,000 hrs. Through R&D efforts of the last two decades, the precious metal loading of PEMFC has been reduced tenfold, from mg/cm2 to tenth of mg/cm2. The PEMFC power density (3.8-6.5 kW/m2) is one of the highest among all modern fuel cells being considered for electric power generation.

It provides a greatest challenge to find alternative fuels that would have the following characteristics:
(1) Direct electrochemical oxidation of fuel.
(2) Low toxicity and high chemical stability.
(3) Low corrosion of current collectors, catalysts, and membranes.
(4) High solubility in H2O.
(5) High energy density.
(6) Fuel oxidation results in environmentally and fuel cell friendly products (e.g., CO2).

Figure 3: Integrated Fuel Processor and Fuel Cell Stack



PEFC commercialization in the forefront among all types of fuel cell. Extensive R&D efforts are going on several fronts to make the PEMFC power plant much reliable and durable system as well as cost competitive and very compact for automotive applications. There are several important research areas where a significant impact can be made on the improved performance, reliability, and cost effectiveness.

(d) MAIN APPLICATIONS:

1. In automobile sector, military, spacecraft and etc.
2. The development of fuel cells will be especially beneficial to India for supply of electrical energy to irrigation pumping sets in the villages and remote areas.

(e) DRAW BACKS OF THE PRESENT MODELS:

1.The resultant low ph level water from fuel cells may corrode / ruin the road surface when the PEMFC is used in the automobile applications.
2. The characteristic of fuel cell output power is low voltage and high current. This presents a unique problem for the power conditioner.
3. Bipolar plates occupy 14-24% principle cost and 80% volume which should be overcome.

CONCLUSIONS

The PEMFC is being developed for automotive propulsion, portable power and distributed power applications. Toyota Prius (commercialized suv vehicle using PEMFC) is the first step in vehicles segment released in commercial market utilizing the fuel cell technology. At present, these fuel cells have gone through demonstration projects for performance levels and anticipated improvements. The major issues are the cost/kW, durability and reliability. Extensive efforts are being devoted to improve the performance with less costly materials, lower material content, more simplified systems/components, less number of parts, addressing transient and steady state performance issues, reducing the losses, etc.

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