Energy Independence an Eco-Friendly Approach

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Abstract

Energy independence as a concept implies total utilization of resource within an area to supply the energy needed for viability and expansion with a high quality of life. The effects of pollution, acid rain, noise, smog and any of the other factors that adversely affect our survival are not necessarily adjuncts to growth. An area either expands or contracts; nothing is completely stable. Also, since we must provide for our long term survival on this planet we do not want to despoil it unnecessarily and henceforth our environment plays a vital role in our survival. But energy has created and led our growth and vastly improved our lifestyle. This paper focuses on modeled after existing programs and facilities already on going and accordingly what attempts could be made to solve each utility's particular problem.

keywords:- Renewable energy, Cogeneration, 9-F Model, Friendliness, Frugality, Fixity.

1. Introduction:-

Energy is bountiful in nature surrounding us. There is energy in the wind shaking the tree, in the sunlight heating the exterior of our building, energy in the green leaf, in the ripening fruit; energy in the flowing river, in the rolling ocean. There is energy in everything we eat and secrete.

The problem is that natural energy is mostly distributed in space and time. Hence we have to manipulate nature by converting, concentrating and storing its bounty of energy, e.g. solar energy can be major source of power its potential is 178 billion MW which is about 20000 times the world demand. In the same manner the energy available in the winds over the earth's surface is estimated to be 1.6 X 10^{-7} MW.

Cogeneration in engineering terminology has come to mean simultaneous generation of heat and electricity from same power station. But there is another meaning of word, i.e. coincident and/or co-operative generation of power from different sources. Both these aspects are covered within the subject matter of this paper.

The paper examines the option on renewal energy available to energy planners and gives examples of typical resource analysis.

2. Option of Renewal Energy Conversion:-

The chart of Fig-(i) shows the renewal energy and non-polluting sources of powers that have been considered suitable for central-station generation of electricity.

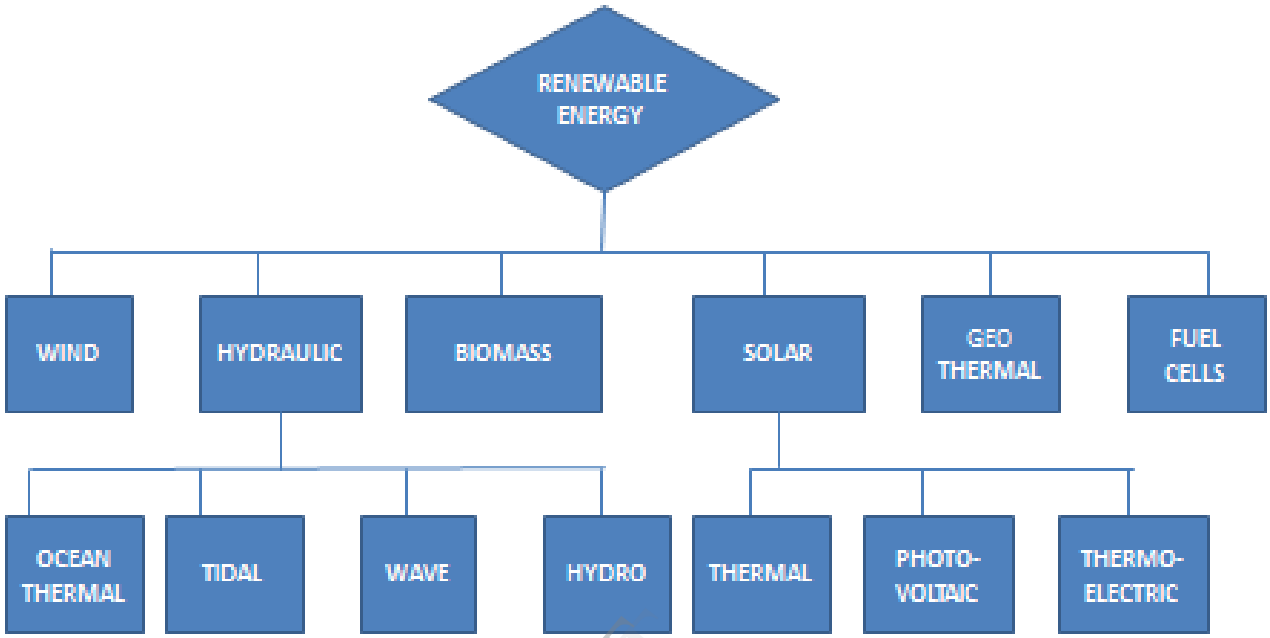

Fig.-(i)

Fig-(i): Currently available major renewal energy options for Cogeneration.

The economic potential of a particular mode of renewal energy conversion is quite different in different places.

Solar photovoltaic conversion is at present the most promising technology. The success of the amorphous method of solar cell production is promising to reduce the costs to a level where solar photovoltaic electricity would compete with the unit cost of conventional small thermal and other generating modes.

The potential of biogas is also high on a worldwide scale. Here is a fuel of high calorific value produced from waste material which have been traditionally considered to be a nuisance and costly to dispose of. The material left after the extraction of methane from a digester becomes a valuable fertilizer.Electricity generation from wind is also developing fast after teething troubles.

3. 9-F Model For System Analysis:-

A block diagram showing the structure of the system analysis methodology and of the step of design of a cogeneration system, is presented on fig(ii). The process can be complex because of the possible number of choice available.

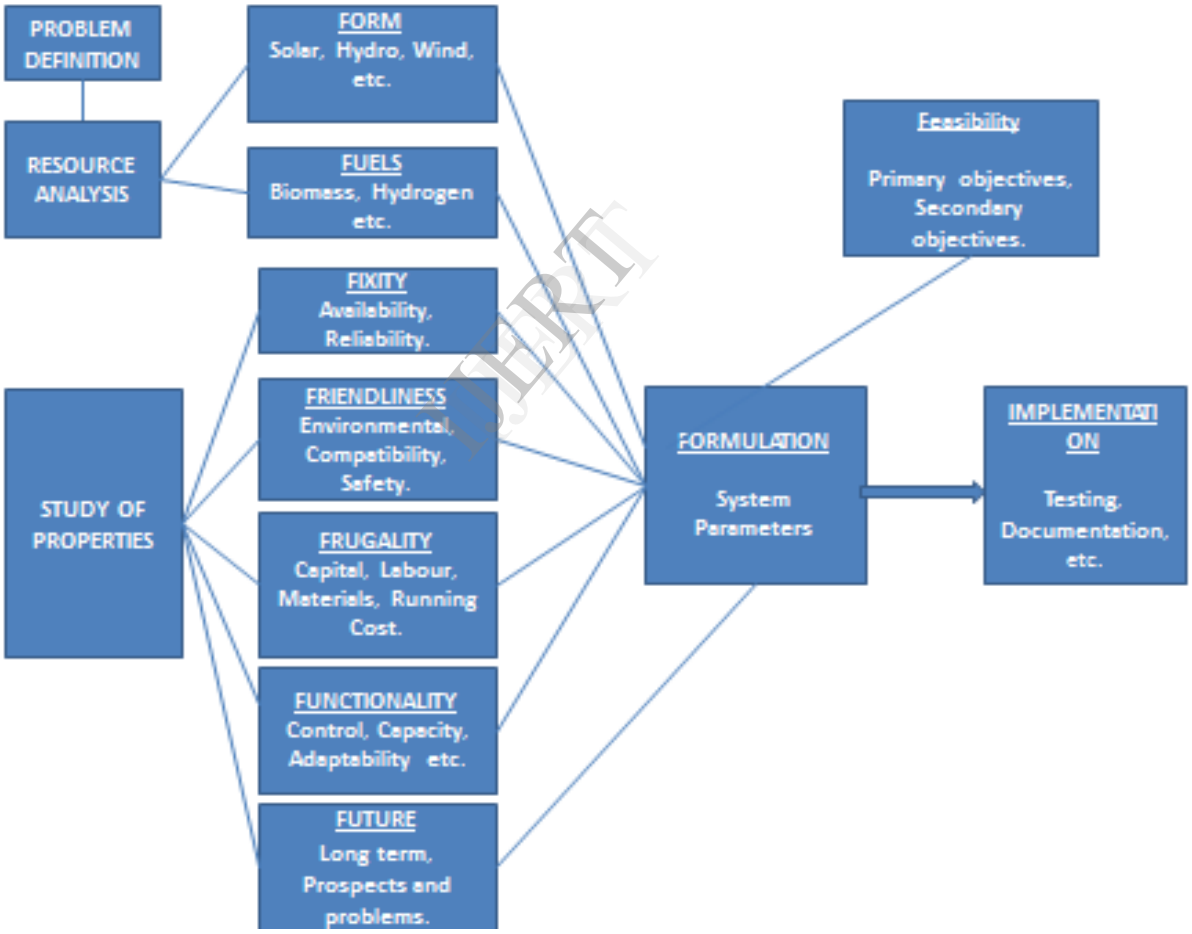

Fig.- (ii)

The initial problem definition would include a demand and load analysis. This would be followed by resource analysis. The later would include a study of critical characteristics of resources. In the diagram the resource are characterized by either the form of natural energy or the fuel. The critical properties are summarized under the headings of fixity, friendliness, and frugality, functionality and future prospects. These properties decide the short and long term success of cogeneration with any form of energy.

Once these analyses are completed, and their results are available, the design of cogeneration system can produce. Primary and secondary objectives are set for the design and feasibility of meeting these objectives is studied.

After the feasibility study is completed, the final parameters of the system are formulated. The system can be implemented.

Implementation includes testing of the system and preparing the final documentation.

4. Demand and Resource Analysis:-

Given a situation where demand for power has to be met by combination of renewable energy resources, the starting step is a demand and resource analysis.

The energy demand is variable with time and so most of the renewable resources in their natural forms. The task is to match the supply to the demand, whether the demand is existing or anticipated, aggregate power consumption would plotted to show the maximum requirement over any period of time. The capacity of the energy supply would be selected on this basis.

In resource analysis, firstly the physical potential of renewable energy in the region is surveyed.

5. Fixity of Renewable Power Sources:-

One of the major shortcomings of the many renewable energy sources is their lack of fixity, i.e. variable availability. Hence a degree of storage has to be provide for a solar, wind and tidal schemes to compensate for stochastic nature of energy sources.

On the other aspect 0f fixity is reliability, i.e., immunity from failures and operating life. It is determined statistically by field testing or simulated life testing.

6. Friendliness of Renewable Power Sources:-

This has several aspects:

1. Environmental impact;
2. Safety aspect; and
3. Compatibility with other energy modes and other activities.

7. Frugality of Power Sources:-

A complete assessment of the frugality, i.e. economic performance, generally first cost, i.e. capital, materials and labour mainly taken into account, on the other hand fuel cost is zero and also life cycle costs of pollution is zero.

8. Functionality of Power sources:-

The existing technology of electronic sensors, transducers and control apparatus has been adapted for the control of the equipment designed.

Microcomputer control is predestined to be used for regulation of generation and cogeneration system.

9. Future of Power Sources:-

When planning a cogeneration system for a life time of 25 years, One ought to prepare for anticipated changes during this quarter century of rapid innovation and societal transitions.

10. Conclusions:-

Factors involved in the choice of renewable energy and in the design of cogeneration systems have been briefly review.

On the basis of 9-F system analysis model a simplified simulation flowchart by solar C for hybrid solar collector is also taken into account.

This paper has demonstrated that integration of renewable energy / co-generation has the potential to work side-by-side to achieve a common pollution free future. It has significant role for municipal utilities, like as appended below:

- The supply of heat which is often neglected in the energy debate;
- Renewable-fuelled power generation technologies that can operate in co-generation mode; and
- The potential for co-generation to provide ECO-FRIENDLY back up for variable renewable electricity

Production.

The key message from this analysis reinforces the notion that integration of renewable being paves the way for Pollution free energy solution.

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