

Renewable Energy Education –A New Paradigm.

Dr. M. Rama

Dept. of Chemistry, Ch.S.D.St. Theresa's College for Women(A), Eluru WG.

Abstract: *Conventional energy sources based on oil, coal, and natural gas have proven to be highly effective drivers of economic progress, but at the same time damaging to the environment and to human health. The reserves of the principal fossil fuels remaining on Earth are limited. Renewable technologies are considered as clean sources of energy and optimal use of these resources minimize environmental impacts, produce minimum secondary wastes and are sustainable based on current and future economic and social societal needs. Renewable energy technologies provide an excellent opportunity for mitigation of greenhouse gas emission and reducing global warming through substituting conventional energy sources. The renewable energy industry is growing rapidly amidst rising concerns about oil depletion and climate change. This has led to a rapid increase in demand for renewable energy specialists who are able to design, install and maintain such systems. Most engineers are not trained to use these renewable energy technologies and most are not aware of the principles of sustainability. Therefore an urgent need to develop and implement new courses that prepare engineers, scientists and energy planners to work with renewables to produce sustainable energy generation systems. Designers, installers and service personnel need to be particularly aware of the industry and the characteristics of the various firms and their technologies.*

Key Words: *Conventional energy- Environment- Renewable energy-sustainability.*

I. Introduction

Education is an important medium of acquiring skills and knowledge. Education bring positive changes in human life. Getting education is the fundamental right of every individual. An education system should provide a new culture of work ethos and an array of young talented, skilled and well equipped target group who will be able to shoulder the developmental responsibilities. The structuring or restructuring of educational system should also contribute to reduce the social gaps by enabling proper recognition to whatever extent one is able to pursue or acquire a skill. Education is a cultural process in which inculcation of norms, values attitudes morals and skills, the members of the society ensures continuity in each generation with regard to various aspects of society.

Today education a powerful agent of social change. It unlocks the door to modernisation. It also paves a sure road to economic modernisation and progress. Education in the modern world is not only a process of learning and becoming wise but also a tool at one's command to survive in this age of competition.

II. Energy Generation – Impact On Environment

The role of energy in development is crucial. Energy fuels economic growth and is therefore of paramount concern for all countries. Energy use in developing countries is closely linked to a range of social issues: poverty alleviation, education, health, population growth, employment, enterprise, communication, urbanisation and a lack of opportunities for women. Energy is also strongly linked to the climate and the environment. Most current forms of energy generation and use cause environmental problems at local, regional and international levels, threatening the health and well-being of current and future generations. The health impacts from solid fuel used for cooking and heat are serious due to indoor air pollution. Inefficient combustion of traditional biomass also adds significantly to global warming. Fossil fuels produce vast amounts of greenhouse gases when they are burnt and this contributes to acid rain, climate change and other ecologically harmful effects.

In India we face both, an environmental crisis and a developmental crisis. On the one hand, we are still struggling with the problems of inequality, poverty and improving human development indicators. On the other, environmental pollution and ecological destruction is now a runaway problem. Both these crises are also interacting and reinforcing each other. This is best reflected in our energy sector.

III. Why To Renewable Energy

Finding ways to expand energy services, while addressing the environmental impacts associated with energy use, represents a critical challenge for humanity. Renewable resources are better for the environment, and better for future generations as well. It is important for all of us to take good care of our planet. In recent

years there has been a significant development of alternative energy technologies, both in terms of performance and cost reduction. Many developing countries are particularly well positioned when it comes to developing a new generation of energy technologies. Apart from development and environmental benefits, renewable energies have the potential to provide increased security and economic stability.

Renewable energy has been an important component of India's energy planning. Renewable energy plays an important role in the long-term energy supply security, diversification of energy mix, energy access, environmental security and sustainability. Renewable energy is bound to play an increasing role in future energy systems. Depending on where you live, it may be more convenient to use one type of resource. For example, people who live beside windy coast lines may find that wind power is the cheapest and most convenient source of energy for them. People who live in hot countries, moreover, may find that they can generate abundant energy from solar panels.

IV. Renewable Energy –In India

The Ministry of New and Renewable Energy (MNRE) in India has been facilitating the implementation of broad spectrum programs including harnessing renewable power, renewable energy for rural areas for lighting, cooking and motive power, use of renewable energy in urban, industrial and commercial applications and development of alternate fuels and applications. In addition, it supports research, design and development of new and renewable energy technologies, products and services. Financial support has also been extended to research and development (R&D), information & publicity and other support programs. Renewable energy projects can have a significant impact on job creation.

The National Action Plan on Climate Change also points out: "India is a tropical country, where sunshine is available for longer hours per day and in great intensity. Solar energy, therefore, has great potential as a future energy source. It also has the advantage of permitting the decentralized distribution of energy, thereby empowering people at the grassroots level".

The World Future Energy Summit (WFES), which took place in the United Arab Emirates capital brought together business leaders, government representatives, non-governmental organisations, teachers and students, many of whom stressed the importance of education in attaining renewable energy goals. A broad-based education which gives the momentum for renewable energy in society is needed. It is not only need to educate students who can work in future renewable energy areas, but need to train already established professionals in how to use the new technologies. No single renewable source can meet all the energy needs, and that's why universities need to offer programmes that cover a range of technology in the sector. The research and education are key in the transition to a low-carbon society. The young generation understands the basics of the renewable energy and have to focus so much on education.

This has led to a rapid increase in demand for renewable energy specialists who are able to design, install and maintain such systems. Most engineers are not trained to use these renewable energy technologies and most are not aware of the principles of sustainability. There is therefore an urgent need to develop and implement new courses that prepare engineers, scientists and energy planners to work with renewables to produce sustainable energy generation systems.

V. Renewable Energy Education

Renewable energy education is a relatively new field and previously it formed a minor part of traditional engineering courses. These days it has an identity of its own, with special techniques, standards and requirements which are not normally encountered in other disciplines. Attempts to add one or two units of study on renewables into traditional science and engineering degrees are unlikely to produce graduates with sufficient knowledge or understanding to use renewables effectively. Modern renewable energy education includes a study of the technology, resources, systems design, economics, industry structure and policies in an integrated package. This prepares the graduates to design sound systems from amongst the range of options available. There are more pitfalls in the use of renewables than there are in using the more mature conventional technologies and systems. Designers, installers and service personnel need to be particularly aware of the industry and the characteristics of the various firms and their technologies. Over the past decade several new approaches have emerged to renewable energy education that seek to address the needs of the 21st century for sustainable energy supply systems.

VI. Human Resource Development: Ministry of new and renewable energy HRD division: Govt. of India

A systematic manpower development effort in the Ministry was started in 1999-2000 for project planning, system design, product development, operation, maintenance and repair of deployed systems for the first time by way of introducing a scheme for renewable energy training and study tours with provision for

organizing short duration training programmes of one to two weeks within and outside the country. These schemes were reoriented to cater more manpower requirement in view of up gradation/reorientation of the programmes of the Ministry during the year 2008-09 with following provisions: i. Organization of training cum-study tours; ii. Development of training modules including pedagogy through expert(s)/expert institutions(s); iii. Addressing long-term HRD needs: In order to gravitate students and professional in the field of renewable energy and also to prepare manpower through universities/technical institutions ready to work on various aspects of renewable energy, the following are also part of the scheme:

- a) Enlarge coverage of renewable energy fellowship scheme by covering more universities/institutions and also R&D institutions, to conduct research on all aspects of renewable energy. This way the R&D programmes will not be limited only to a few technology institutions rather it will have larger spread across the country;
- b) In order to address the curriculum needs of technical institutions to cover renewable energy, there is urgent need to develop model curricula for inclusion in the ITIs, diploma and degree course. The curricula and the course material so developed would be circulated to all such institutions through State Technical Education Boards and AICTE.

While the reoriented scheme has been fulfilling the short term requirement of manpower, for systematic and long term manpower requirement for renewable energy development in the country in the light of recent initiatives of the Government in the form of National Action Plan on Climate Change (NAPCC) and National Solar Mission clubbed with Renewable Purchase Obligation (RPO) of Electricity Act 2003 and recently announced Renewable Energy Certificate (REC) mechanism, it was thought necessary that an institutional framework is developed in existing educational institutions to cater requirement of quality education and training in the field of renewable energy by these institutions. Therefore new provisions have been added to the HRD Scheme (Addendum/Amendment of the HRD Scheme, Revision of Fellowship of M. Tech / M.E. students, Revision of Fellowship of JRF and SRF Scholars) as follows:

To augment the existing national renewable energy fellowship scheme to incorporate providing fellowship to 400 students/researchers from existing 50.

The 400 fellowships will be distributed as follows:

Table:1-fellowships distribution:

Course	Duration	Intake every year	Fellowship 1 st Year	2 nd Year	3 rd Year (stabilized no. for subsequent years)
M.Tech	2 year	200	200	400	400
M.Sc	2 year	100	100	200	200
JRF	2 year	40	40	80	280*
SRF	3 year	40	40	80	120
RA/PDF	3 year	20	20	40	60
TOTAL		400	400	800	960

*This includes 200 integrated M.Sc students joining JRF.

While JRF/SRF/RA/PDF will be open for all Universities, Technical Institutions, National Laboratories having facilities for research in identified thrust areas of Ministry's R&D Programme, the M.Tech. and Integrated M.Sc. will be implemented in empanelled educational institutions having M.Tech./Integrated M.Sc. courses in energy studies/renewable energy with specialization in any branch of renewable energy. A maximum of 20 such institutions with 15 seats per institution will be selected based on open advertisement methodology. For rest of the fellowships, the selection will be made through open advertisement and evaluation of the received applications by a committee of experts. TERI University, Delhi has been assigned the responsibility to coordinate the scheme on behalf of Ministry. TERI University therefore is doing the fund management and recordkeeping of the fellowship scheme in lieu of getting service charge from the Ministry.

ii. To provide financial assistance to educational and research institutions to set-up infrastructural facilities such as laboratory, library and other teaching aids.

Educational Institutions will be provided one time financial assistance to upgrade existing laboratory facilities and library facility for undertaking renewable energy educational programme to the tune of Rs. 50,00,000/- (Rupees Fifty Lakhs only) per institution. A maximum of five institutions will be provided such grant every year. The selection of such institutions will be done either through open advertisement or selecting five accredited institutions for M.Tech/Integrated M.Sc. fellowships. In addition Advanced Training Institutes of Ministry of Labour will also be provided grant for upgrading trainers training facility for renewable energy in their institutions. **Guidelines for providing Financial Support to the institutions have been finalised**. Lucknow university was provided financial assistance during 2010-11.

iii. To institute Renewable Energy Chair to act as focal point for renewable energy education in the institution in at least one educational institution every year by providing one time grant. Such Chairs will be instituted in 15 educational institutions.

Such educational institutions which have been active in the field of renewable energy education can be considered for institution of RE Chair. While 12 Chairs will be dedicated to science and technology aspects of Renewable Energy, 3 Chairs will be dedicated to legal, environmental, management and economic aspects of Renewable Energy in institutions such as National Law Institutes, IIMs, Institute of Economic Growth, Delhi University etc. To facilitate sustainability of this concept, a onetime grant of Rs. 1.5 Crore is being provided to the selected institutions which may be kept in fixed deposits and the salary and research grant may be provided through interest of this fixed deposit. The respective institutions may also augment through funds from their routine grants. **Guidelines for providing RE chairs to the institutions have been finalised.** IIT Kharagpur and IIT Roorkee were awarded RE Chair during 2010-11.

iv. To initiate integrated M.Sc. &Ph.D programme in various fields of renewable energy by instituting scholarship schemes.

To encourage talented science students to take renewable energy as a subject in post graduate level followed by active research in renewable energy area (both basic as well as applied R&D), Ministry may institute scholarship schemes at post graduate level to the tune of Rs. 4000/- (Rupees Four Thousand only) per month to selected students during his PG studies followed by awarding him NREF for a period of maximum five years. 100 such fellowships every year may be granted in ten accredited institutions. A model Course Curricula has been prepared by the Ministry. Which may be utilised by the educational institutions.

v. Ministry will be empanelling the educational and other entities to undertake short term training courses on regular basis. While some of these short term training courses will be supported by the Ministry as per the provisions of the scheme, institutions will be encouraged to undertake self financing courses on various aspects of renewable energy.

vi. In addition, Ministry had taken up the issue of incorporation of Solar Lighting, Solar Thermal and Small Hydro Power in the regular syllabus of ITI students of certain trades such as electrician, fitters, turners, welders, plumbers etc. The course material was prepared and passed on to Directorate General of Employment and Training and it has been incorporated in the syllabus of trades of ITIs so that about 16-60 hours will be devoted on Renewable Energy skill development during regular two-year ITI course. DGET is also planning to start special programme of skill development under their Craftsman Training Programme (CTS) and Modular Employment Skill Development Programme (MES), wherein they provide special training for 60-960 hours. Ministry will be provided the technical input as well as assessor for these courses.

vii. In addition to these initiatives, Ministry has launched a special fellowship scheme entitled “National Solar Science Fellows Programme”, under which 10 eminent scientists will be awarded fellowship of Rs. 12 lakh per annum, contingent grant of Rs. 5 lakh per annum and Research grant of Rs. 15 lakh per annum.

viii. To facilitate scalable new business models and start-ups in the sustainable energy space, Ministry of New and Renewable Energy (MNRE) has joined hands with IIM Ahmedabad’s Centre for Innovation Incubation and Entrepreneurship (CIIE) to set-up the Indian Fund for Sustainable Energy (Infuse).

CIIE and Infuse aims at providing mentoring, acceleration and funding support to scalable ideas across the cleantech space. Other partners like International Financial Corporation, Asian Development Bank, BP, Technology Development Board, Godrej Industries, ICICI Bank, Bank of India and Union Bank are also supporting this endeavour. The purpose of this partnership is to support new business models rather than creating new technologies, which are anticipated to have much longer gestation periods and therefore out of scope of this initiative.

VII. Conclusion

Renewables can bring significant major benefits to developing countries. We must take action at international level to ensure that renewable energies play their role in poverty reduction and in improving living conditions for people. The developing world is increasingly recognising that renewables offer good opportunities for sustainability and energy security. We need to mobilise the promotion of sustainable energy development on a global scale and suppress the negative effects of global climate change. In view of the increasing global interests in renewable energy, there is a strong need to evolve progressive and efficient institutional structures and to create a favourable policy environment to promote research and development, public-private partnerships and international collaborations.

References

- [1]. TERI(2011): Towards Energy Security, 10 January, accessed on 15 Jan 2011 (www.teri.in.org)
- [2]. Singh Manmohan(2010): To create solar Village, Jan, Solar Energy Review, New Delhi
- [3]. Chatterjee, Pramita(2010): For Clean Green Energy, Economic Times, October 1st, pp-7
- [4]. Delhi International Renewable Energy Conference(DIREC-2010): accessed on 12 Dec,2010(<http://www.direc2010.gov.in/>)
- [5]. US-India Energy Partnership Summit, Washington DC(2010); Solar Energy Review, NewIRENA. (2015). *Renewable Energy and Jobs - Annual Review*. Delhi-India.

- [6]. RE-Invest 2015. (n.d.). *Investors Guide*. Retrieved from http://www.re-invest.in/Document/original/15.REInvest_2015_Investors_Guide.pdf