SYNTHESIS

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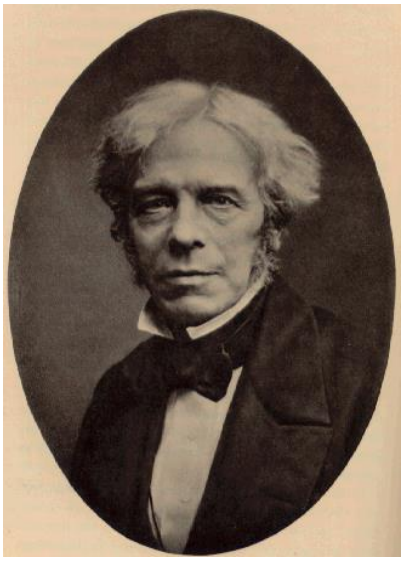
Michael Faraday (22 September 1791 – 25 August 1867)



Faraday Follows in Franklin's Footsteps

Following in the footsteps of Ben Franklin and other early scientists, Michael Faraday studied the nature of electricity. Born on September 22, 1791, this famous English physicist and chemist is best remembered for his understanding of electromagnetism. Once Faraday discovered that electricity could be made by moving a magnet inside a wire coil, he was able to build the first electric motor. He later built the first generator and transformer. He introduced several words that we still use today to discuss electricity: ion, electrode, cathode, and anode.

Faraday is also remembered for his contributions to the study of chemistry. Most noteworthy was his discovery of benzene, a common carbon compound. Later in life, Faraday became Professor of Chemistry at the Royal Institution. He was a powerful speaker and his lectures were popular. Every year on Christmas Day, he presented his Faraday Lectures for Children which were crowded with interested listeners. To honor his accomplishments, a unit of electricity was named after him. The "farad" measures capacitance, an amount of electrical charge. Faraday lived his whole life in England, where he died on August 25, 1867.

"He speaks with ease and freedom, but not with a gossipy, unequal tone, alternately inaudible and bawling, as some very learned professors do; he delivers himself with clearness, precision and ability. Moreover, he speaks his language in a manner which confirmed me in a secret suspicion that I had, that a number of Englishmen speak it very badly." – by Friedrich Von Raumer.

"Successful leadership is not about being tough or soft, sensitive or assertive, but about a set of attributes. First and foremost is character." - Warren Bennis.

DEPARTMENTAL NEWS :

- Paper published on **"A Conceptual Study for Control Strategy of TCSC in Inductive and Capacitive Region"** in 2014 International Conference on "Circuit, Power and Computing Technologies [ICCPCT]" and in IEEE Digital Explore by Debanjan Chatterjee, Arkendu Mitra, Sudhangshu Sarkar.
- Paper published on **"A Study for Exploring Optimal Location for Installing SVC in IEEE 14-Bus System"** in National Conference on "Recent Trends in Power Engineering [NCRTPE-2014]" by Shaon Paul, Sudhangshu Sarkar, Amlan Chakrabarti, Arkendu Mitra.
- Paper published on **"Stability Improvement of Distribution System in the Presence of Distributed Generation"** in National Conference on "Recent Trends in Power Engineering [NCRTPE-2014]" by Goutam Ghosh, Sudhangshu Sarkar, Arkendu Mitra.
- Paper published on **"A Study for Exploring Optimal Location for Installing STATCOM in IEEE 14-Bus System"** in National Conference on "Recent Trends in Power Engineering [NCRTPE-2014]" by Goutam Ghosh, Sudhangshu Sarkar, Arkendu Mitra.

Energy and Power Scenario in India

Late Prof. A. K. Mukhopadhyay
Emeritus Professor of Electrical Engineering, NIT
Former Vice Chancellor, Tripura University
Former Sir R.B. Ghosh Professor of Calcutta University

India is one of the countries where the present level of energy consumption, by world standards, is very low. The estimate of annual energy consumption in India is about 330 Million Tones Oil Equivalent (MTOE) for the year 2004.Accordingly,the per capita consumption of energy is about 305 Kilogram Oil Equivalent (KGOE).As compared to this, the energy consumption in some of the other countries is of the order of over 4050 for Japan, over 4275 for South Korea, about 1200 for China, about 7850 for USA, about 4670 for OECD (Organization for economic cooperation and development) countries and the world average is about 1690.

In so far as electricity consumption is concerned, India has reached a level of about 600-kilowatt hour (kWh) per head per year. The comparable figures for Japan are about 7,800, for South Korea about 7,000, for China about 1380, for USA about 13,000, for OECD countries about 8050 and world average are about 2430.Thus,both in terms of per capita energy consumption and in terms of per capita electricity consumption, India is far behind many countries, and as a matter of fact, behind even the world average. Therefore, to improve the standards of living of Indian people and to let them enjoy the benefit of economic development, it is imperative that both energy consumption and electricity consumption level is enhanced. India is targeting a growth rate of 9 – 10%, having already reached a level of almost 8%. To sustain the double digit growth rate for next 10 -15 years, it would be essential that the level of energy availability and consumption, and electricity consumption in particular, is enhanced substantially.

Coal Sector: As mentioned earlier, coal constitutes the most dominant constituent of the energy sector. In the year 2005-06, the coal production was over 370 million tones. Power Sector consumes almost 80% of coal that is produced. India has large coal reserves of the order of 200 Billion Tones, most of these are high ash content coal in the calorific value range of 3000 kilo calorie per kilogram to 4,500 kilo calorie per kilogram and ash content in the range of 30 – 45%. Using the high ash coal for the power sector is a major challenge, from the point of view of achieving high level of efficiency of consumption, and more particularly, from the point of view of environmental management due to fly ash emissions.

Oil Sector: Oil constitutes over 35% of the primary energy consumption in India. It is expected that this would rise both in terms of absolute amount and proportion. The demand projection is placed at about 200 million metric tones by the end of the 11 Five Year plan i.e. by 2011-12 and over 250 million metric tones by 2024-25.The present level of demand about 120 million metric tone of oil equivalent.

Gas Sector: Natural gas constitutes about 9% in the India's energy profile, as compared to about 25% world average. About 45% of natural gas is consumed by power sector and about 40% by the fertilizer sector. The balance 15% goes for various other consumption. At present about 65 million cubic meters of gas per day is being consumed and it has the potential for increase.

Nuclear Power: India has established its capability in design, engineering, construction and operation of nuclear power plants. The installed capacity is 3310 MW, less than 3% of total installed capacity of power, consisting of two Boiling Water Reactors and twelve Pressurized Heavy Water Reactors, eight more reactors (total capacity 3420 MW) are under construction. India believes that nuclear power could be a good source of its power profile and therefore its proportion should increase from 2.6% to say 7 to 8% by 2030 which will mean a capacity of over 55,000 MW. Department of Atomic Energy, therefore, has evolved an approach and perspective which includes setting up of Pressurized Heavy Water Reactors in the first stage, Fast Breeder Reactors in the second stage and Reactors based on Uranium 233 – Thorium 232 cycle in the third stage. Construction on two units of 1000 MW at Kudankulam in Tamilnadu, as per the agreement between India and Russian Federation marks the beginning of introduction of Light Water Reactors (LWR).

Conventional Sources of Electricity Generation: Fossil fuel based thermal power, hydro-electric, and nuclear constitute the conventional sources of power. Non-conventional sources are less than 5% of total installed capacity in India. The present installed capacity (as in March 2006) is about 1,25,000 MW, consisting of coal based plants (56%), gas based plants (10%), hydro-electric (26%), nuclear (3%) non-conventional (5%).Indian Power Sector was opened up for private power generation in 1991. In terms of ownership structure, the profile consists of Central Government owned companies (32%), State Govt owned companies/Electricity Boards (57%) and Private Sector (11%).

Non Conventional Energy Sources: Indian Government has accorded very high priority to develop and expand installed capacity base through non-conventional sources of electricity generation. India has very high potential for these capacities

Energy	Potential (MW)	Existing capacity (MW)
Wind	45,000	4,400
Small Hydro (upto 25 MW)	15,000	1,700
Solar (PV)	20 MW/Sq.Km	Very little
Biogas plants	12 million	3.8 million
Urban/Industrial waste based plant	2,700	Very little

It may be seen from the above that India has achieved substantial success on wind turbine based power generation. Ministry of Non-conventional Energy Sources (MNES) has set a target of achieving at least 10,000 MW capacity through various non-conventional sources, by the year 2012.

Rural Electrification: 56% of Rural households (about 78 million) do not have access to electricity. Government of India has launched a massive programme called "Rajiv Gandhi Grameen Vidyutikaran Yojana" to provide electricity access for all by 2012 and electrify all villages by 2009.The scheme aims at creating Rural electricity infrastructure to cater to the requirements of Household needs, Agriculture and irrigation pump sets, Cold Chain, Small and medium industries, Social services – Health, Education.

Conclusion: India targets 9 – 10% economic growth rate in a sustainable manner over next 10-15 years.There are shortages in all the energy segments. Substantial expansion of capacities in coal, petroleum, gas and electricity is, therefore, the thrust of the Government policies and programmers. Ultimate goal is to develop these markets and facilitate, their matured functioning in a competitive manner. Skillful development of road maps to reach the goal is a challenge. In most cases, development of energy sector, in various segments, has happened under government-controlled organizations. Over last 10-15 years, private investments are being encouraged, particularly in petroleum, natural gas and power. While India is fully committed to develop and expand its energy markets, it is equally committed to ensure environmental safeguards. Using latest cost effective technologies in all the energy segments forms an important part of policy and strategy.

RENEWABLE ENERGY SOURCES

Anurag Singh
B. Tech. Electrical, 4th Year

Energy

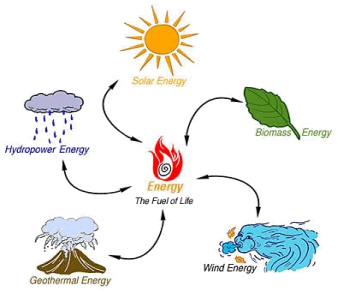
Energy is referred as capacity to do work. Energy sources are those sources which provide us with capacity to do any work. In broader sense Energy is seen as indispensable for economic growth and development. The quality of life in a country is measured by its energy consumption. For instance the US with just 4.6% of world's population, consumes 24% of the total commercial energy used.

RENEWABLE ENERGY SOURCES

Energy sources which can be replenished by natural processes and hence can be used indefinitely are known as Renewable energy sources.

Non-renewable Energy source	% of Total energy	Subtotal %
OIL	32	
Coal	21	
Natural Gas	23	
Nuclear	6	
Non renewable Total		82
Renewable source		
Biomass (mainly wood)	11	
Solar, wind, water	7	
Renewable Total		18

The table shows that a significant percentage of Energy used is Non renewable. As these sources will not last many years, hence we have to find alternative Energy sources.



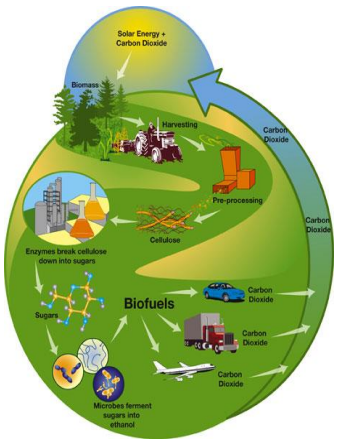
Energy from Biomass

Though other Renewable sources are dependent on Climatic or geographical factors, Biomass is dependent on plant deads, animal wastes etc. So these Energy sources are available till life exists. A lot of research is needed for using these sources, since these sources cannot produce energy in required forms. In a Country like India these sources are really promising since agriculture is still the prime job here.

Energy in Different form are developed by different organizations from Biomass, Some of them are,

ENERGY FROM WASTE

The Tamil Nadu Agricultural University (TNAU) Coimbatore has developed a fuel efficient fuel-mass gas stove. The bio-gas produced from animal and crop waste is used for domestic and agricultural purposes. Biomass gasifiers convert agro-wastes into clean and combustible gas, which is used to run rural agricultural gadgets. The method consists in removing CO and H_2S from the crude gas, which undergoes



reaction with steam. In this process, the crude gas gets converted into a hydrogen-rich gas that is used in a fuel cell to produce electricity. This fuel-efficient and pollution-free system has been developed rural electrification; it uses biomass instead of industrial hydrogen. The advantage of this system is that biomass can be stored and used when the need arises. The whole process and products are ecofriendly.

ENERGY FROM *IPOMOEA*

Biomass gasification technique can be used in rural areas. Gasification refers to the technique of converting biomass into a combustible gas. A new technique for generating electricity from Ipomoea (creeping plants) has been developed in Madhya Pradesh. This power plant utilizes a biomass gasifier to produce 100 kW of electricity .the technology for converting electricity has been developed by Indian Institute of Science (IIS) Bangalore. Ipomoea plants grow around water bodies. The gasifier consists of a reactor, cooler blower and filter. Gas is generated inside the reactor, which goes through a cooling and cleaning system. The purified gas is then used for power generation. The whole process does not produce pollution. It is renewable source of energy.

The Story of Ranidhera:
Growing *jatropha*, getting energy

The 120 houses in the small village of Ranidhera in Kabir dham District Chattisgarh have never had electricity. Nor have the villagers seen any development project. Things are now set to change, however. Ranidhera is the location of a pilot project in which biofuel (or biological fuel) is being used to produce power for a village. The project has been initiated by the voluntary organization Winrock International from the UK. The idea is to use vegetable oil to run generators and supply power to the entire village.

The project began in 2004. After convincing the villagers to try out the biofuel method, Winrock helped them to plant *jatropha* a shrub-like plant. The villagers started growing the plant on common land and around their fields in addition to their normal crops. About 25000 saplings are now produced seeds. The seeds are crushed to extract the oil.

A 6 HP generator has been jatropha oil. The generator has can supply to each other house enough power to operate two lights, a TV and a fan for producing power every evening.

Limitations of Biomass energy
Large areas of land would be required if we want substantial quantities of fuel.
Public awareness is required for large scale.
Farmers also have to consider the inputs and returns.

Final Year Projects for M. Tech. EE – Power System 2014-2015

Title 1: Time-of-use Tariff: An approach in the Indian Market.

Title 2: PID-MPC based Automatic Voltage Regulator Design to reduce the Operation Time of Automatic Voltage Regulator.

Title 3: Short Term Load Forecasting for the Festive Days of West Bengal using Time Series and Seasonal Trend.

Title 4: Power Converter for Synchronizing Induction Machine with Microgrid.

Title 5: Fault Detection in Synchrophasor System within Three Cycles

Title 6: Analysis of Transient Current of a Power Transformer due to Switching Phenomenon.

Title 7: Fault Detection in Synchrophasor System within Three Cycles

Title 8: Design & Implementation of Hybrid Renewable Generation for Economic Feasibility & Environmental aspects for a Remote Location Village.

Title 9: An Analytical Approach to Participation Factor based Distributed Slack Bus Modeling in Optimal Power Flow.

Title 10: Analysis & Controller Design of STATCOM for Power System Voltage Regulation.

Title 11: A Study of Reduction of Line Harmonics in AC Transmission using Active Filter Design.

Title 12: Design of Rotating Mechanism of Wind Turbine to Maintain a Stable Voltage.

Title 13: Advanced Home Energy Management System Implementation through Renewable Resources.

Title 14: Analysis of Distribution Network with a High Penetration of Distributed Generation.

Title 15: Modeling and Simulation for Maintaining a Constant Voltage of High Step Up DC-DC Converter for Microgrid Application using Microcontroller.

Title 16: Grid Connected Multi-level Converter

Call for Contribution : Contribution for the Quarterly Newsletter are invited from all faculty, staff and students of NIT. The contributions may be in the form of an article not exceeding 800 words, local, national and global news related to Electrical Engineering. The prospective contributors are requested to forward their contributions to the mail address : "arkendu83@gmail.com".

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