Electric Power Today
Biggest Source Of Energy
As Well As
Biggest Source Of Pollution
In Human Society

1. Electric Power—A Form Of Energy

Energy represents the motion, movement or action which is embedded in every phenomenon in the universe. All varieties of existence in the universe depend upon energy for every activity.

Energy is characterised by various forms. For example, heat energy is one form of energy which is directly obtained by burning wood. Steam energy is another form which is produced by burning oil. Nuclear energy is still another form which is created by generating a fission in the nucleus of the atom. Wind, water and solar energies are yet some other forms.

Energy is one of the two aspects of the fundamental concept of Physics, the other being matter. According to this fundamental concept of Physics, energy cannot be created or destroyed. But it may be developed from matter and turned into matter.

Throughout his history, mankind has developed and used various forms and sources of energy. In his early beginnings, people had only the strength of their arms as the form of energy. Later, they learnt the use of fire (about 12 lakh years ago) as a form of energy, followed by the use of the energy of the wind to move water sailing vessels, water energy to run water mills, animal energy to pull the bullock-carts and farming plows (about 3,000 years hence).

Until the mid-1700's, wood ranked as the most important fuel. The ever-increasing use of timber made it scarce and coal gradually began to take its place. The growing demand for coal brought a search for better mining methods, leading to the discovery of pump to drain coal mines. The pump, powered by the steam energy, soon developed into a steam engine—a new device to change heat energy into mechanical energy.

In the early 1830's, the discovery of the way to turn mechanical energy into electric energy brought forth the concept of electric power—a higher useful way of using energy in varying processes.

2. Sources Of Energy

The world's chief sources of energy, in order of current importance, are fossil fuels, water power, and nuclear energy. Wood, solar, wind, tidal, chemical, and geo-thermal sources also provide energy. Future energy sources may include: fuel cells, solid and liquid wastes, hydrogen, and magnetohydrodynamic (MHD) generators.

Fossil fuels, in order of the amount used worldwide, include petroleum, coal, and natural gas. Bituminous sands and oil shale form important energy resources for the future.

Petroleum furnishes about 40 percent of the world commercial energy used in the world. Coal provides about 26 percent of all the world commercial energy. Natural gas accounts for about 21 percent of the commercial energy used in the world. Natural gas is a clean source of energy. Water power, or hydropower, furnishes about 7 percent of the world's commercial energy. Nuclear energy provides about 6 percent of the international commercial energy. Wood once served as the world's chief fuel. In many developing countries, wood is still the main source of heat energy. Solar power can provide a clean and almost unlimited source of energy. Wind power turns windmills and propels sailing boats. Tidal energy comes from the gravitational energy of water as it flows from high tide to low tide. Chemical energy is released during chemical reactions. The most common use of such energy is to generate electric power in batteries. Geo-thermal power is generated wherever water comes in contact with hot rocks below the earth's surface. The production of geo-thermal energy can occur only in areas where hot rocks lie near the earth's surface. Bolivia, Iceland, Italy, Japan, the

Philippines, New Zealand, and the United States have developed geo-thermal power plants. Solid and liquid wastes also can provide energy.

Hydrogen could someday replace both gas and oil as a fuel. Making hydrogen an energy source today is a costly affair.

3. State Of Electric Power In The World

Since the beginning of the 20th century, electric power has become the chief source of energy in human society. It lights, heats, and cools many homes, runs many home appliances, like televisions, refrigerators, etc., operates machinery in factories, is used in running many business machines, like computers, elevators, etc., in stores and offices, drives trains and subway systems and performs such tasks as pumping water, milking cows and drying hay on farms.

Electric power is measured in units called watts. 1,000 watts constitute 1 kilowatt. The amount of energy used is expressed in kilowatt hours. A kilowatt hour equals the amount of work done by 1 kilowatt in one hour. If one burns ten 100-watt bulbs for one hour or one 100-watt bulb for 10 hours, one uses 1 kilowatt-hour of electric energy.

Huge electric generators in power plants produce almost all the world's electric power. The world's electric power plants can produce about 2314 billion kilowatts of electric power at any given time.

The major types of electric power plants are: (1) fossil-fueled steam electric power plants, (2) hydroelectric power plants, and (3) nuclear power plants. Various other kinds of power plants produce smaller amounts of electricity.

Fossil-fueled steam electric power plants generate about 63 percent of the world's electric power, Hydroelectric power plants generate about 20 percent of the world's electric power and nuclear power plants generate about 17 percent of the world's electric power.

Other sources of electric power produce relatively small amounts of electricity. Geo-thermal power plants use steam from the depths of the earth to run turbines that drive electric generators. Some power plants harness wind energy by using windmills to drive electric generators. A number of power plants use the energy of the ocean tides to turn turbines that run generators. Some burn wood or agricultural wastes to drive generators. A few power plants convert the sun's energy into electricity by means of devices called solar cells. Producing electric power with solar cells is expensive. However, scientists and engineers are studying ways to improve solar cells in order to produce large quantities of electric power more economically.

Looking at the availability and distribution of power at the world level, one finds a highly unjust and unequitable position obtaining everywhere. The chief feature of this unfair situation is that, while 20 percent of world population living in the developed countries gets and uses 80 percentof the total world electric power, the rest 80 percent of the total world inhabitants in the developing countries have to pull only on the 20 percent. The per capita availability of power in the US is nearly 30 times greater than that existing in the least developed countries.

Similar unequitable distribution of power also exists within each country where more or less the whole power is consumed by industrialists, big farm owners and rich persons.

4. State Of Electric Power In India

The electric power industry in India is now more than a century old. During the first 50 years of its existence, it was able to establish a total installed capacity of 1362 MW (at the time of India's independence in 1947). In the post-1947 period, it began to develop at a little faster speed. In 1950, it grew to 1,713 MW and has today grown to around 1,09,973 MW (Thermal 78,340 MW, i.,e., 71.2 percent; Hydal 28,910 MW, i.e., 26.3 percent; and Nuclear 2,720 MW, i.e., 2.5 percent). Obviously, most of the generation is thermal one and predominated by the central and state governments.

To regulate the electric power sector, the first Indian Electricity Act was enacted in 1910, followed by a comprehensive legislation to regulate the electric power supply, called the Electricity Supply Act 1948. It was first amended in 1976. Thereafter in 1991, it was again modified to facilitate private investment. To provide healthy competition and transparency to private investors, the Electricity Regulatory Commission Act, 1998 was enacted. Now the newly enacted Electricity Act 2003 has replaced all the preceding electricity laws.

In the pre-2003 Electricity Act period, the traditional or the regulated electric power system, including its processes of generation, transmission and distribution, was managed by the central government or a single utility. Now when the generation, transmission and distribution and the controlling system under the new Electricity Act, 2003 are separated in terms of management and ownership, the electric power system is said to be deregulated. The deregulation process has already started with the restructuring of State Electricity Boards.

The electric power position as it stands today presents a poor picture. As against the world's average per capita consumption of 2,074 units (kilowatt hour), India has 350. Forty-four percent of its population live without electricity and the majority of those who get electricity receive poor supplies with frequent breakdowns. With investment required far exceeding the available resources, additions to generation capacity have constantly fallen short of target by 40-50 percent. Energy and peak shortages of 7 percent and 12 percent respectively have led to blackouts despite improvements in the plant load factor of thermal stations all over the country. Transmission and distribution (T&D) losses which are equivalent to power produced and not paid for, are at the level around 45-50 percent, pilferage being the major contributor. Cross subsidies continue to foster an imbalance in the tariffs leading to some State Electricity Boards (SEB) officials conniving in power theft which is rampant due to deficiencies in metering and aggregating activities based on energy audit principles.

Given the above facts, if we look at the actual availability of electric power in India, it is in fact 50 percent of the total output. The reason being 50 percent of the entire generated electric power is wasted in the transmission losses (24-27 percent) and the theft (about 25 percent). If the officially estimated 7 percent deficit (in the total electric power production) is added to the wasted 50 percent power, the total deficiency of electric power in the country comes up to 57 percent. This deficit implies that India's present system of electrical distribution is only 43 percent or at the most 50 percent efficient. This huge gap in the supply and demand of electric power is reflected in constant blackouts in the countryside and urban slum areas plus bastis of poor people.

Power shortage constantly goes on retarding the production, both in industry and agriculture. The loss to the Indian economy due to power shortage is now estimated to be around 3 percent of India's GDP. According to one estimate, it (i.e., economic loss) amounted to Rs 50,000 crores last year.

As per the latest expert reports, the cost of electric power production stands at Rs 3 per unit, while it is being sold at a little over Rs 2 per unit. Still, in the global context, India's reduced electric price (a little over Rs 2 per unit) is twice that of international rates. Irregular supply and frequent voltage fluctuations are some other notable features.

Coming to different states in India, the situation, if not worse, is equally bad. All SEBs are running on loss which runs into billions of rupees. In the year 2000-01, it amounted to Rs 26,013 crores. Obviously, this vital resource has financially become unsustainable. The amount of loss differs from state to state, but every SEB is in the grip of a financial crisis.

Other significant features as mentioned in an official publication (orientation programme on power sector reforms-2001, issued by the ministry of power, GOI) of the Indian electric power sector are as under:

* Commercial losses of SEBs increased from Rs 11,305 crores in 1996-97 to Rs 26,013 crores in 2000-01.

* Internal resources generation deteriorated from Rs (-)2,091 crores in 1996-97 to RS (-)13,093 crores in 2000-01.

* Out of total energy generated, it is estimated that only 55 percent (Rs 62,000 crores) is billed and only 41 percent (Rs 46,000 crores) is realised.

* Gap between the average revenue realisation / unit of power and the average cost of supply went up from 50 paise in 1996-97 to 92 paise in 2000-01.

* Industrial and commercial consumers are charged tariff higher than the average cost.

* Reported T&D losses of 25 percent have been grossly under-estimated. Actual T&D loss varies between 40 percent to 50 percent (in developed countries, T&D losses account for 10 percent). The loss to SEB's due to theft is estimated at Rs 20,000 crores annually.

* Inefficient use of electricity by the end consumers.

* Lack of grid disciplines.

* Inadequate inter-regional transmission links.

5. Core Concerns Of Electric Power In Punjab

Turning to the problem of Punjab's electric power, the facts speak for themselves.

The first notable fact is the huge loan accumulated by the PSEB, (the overall agency of handling the problem of electric power in Punjab) during the past 55 years. According to the PSEB's budget estimates, 2003-04, it stood at Rs 6,27,128 lakh, comprising the following sub-heads:

(A) Loans from the state government: Rs 4,53,753 lakh; (B) public borrowings (S.L.R Bonds): Rs 15,800 lakh; (C) loans from LIC: Rs 96,465 lakh; (D) loans from R.E.C: Rs 61,110 lakh.

The other significant facts about the Punjab electric power sector may be stated as follows

There is an acute power shortage in Punjab. Going by the figures available with PSEB, the total power requirment for Punjab is around 830 lakh units a day, whereas generation from its own resources is 440 lakh units. The PSEB has been making purchases to the tune of 190 lakh units a day from other states, yet is falling short of 200 lakh units, necessitating power cuts which at certain places extend upto 8-10 hours.

In the sphere of generation, all sources of generation are working below their respective capacity and need.

In the areas of transmission and distribution (dominated by plagiarism), the total losses go even beyond 50 percent.

Another worrisome feature of the Punjab electric power sector is that it has financially become an entity at a time when this state is already on the verge of finanicial bankruptcy.

There is an urgent need for a new strategy to pull the Punjab electric power sector out of its crisis

6. Electric Power Generation Today

Biggest Pollution Creating Source

The electric power generation has created highly serious problems before mankind. Firstly, it has led to the depletion of fuel reserves that had accumulated during millions of years ago. Petroleum may become the first fuel to give out—growing scarce by the mid-2000's. Natural gas is also being used up quickly. At the present rates of consumption, natural gas may last only slightly longer than petroleum.

Secondly, but more importantly, the production, transportation, and use of fossil fuels—all are adversely affecting our natural environment. The drilling of offshore oil fields and the shipment of petroleum by tankers sometimes result in oil spills that pollute the oceans, contaminate beaches, and kill wildlife. Burying oil pipelines requires changes in the environment, such as the clearing of trees along the route. Underground coal mines can cave in and can release dangerous gases. Strip mining has exposed large areas of land to erosion. The burning of coal and oil pollutes the air with nitrogen oxides and sulphur dioxide. These substances can react with moisture in the air and fall to earth as acid rain, polluting lakes and rivers. Motor vehicle fuels rank as a leading source of air pollution.

Even the cleanest fossil fuel produces carbon dioxide when it burns. Carbon dioxide is a harmless gas. But a build-up of this gas in the atmosphere may cause a phenomenon called the greenhouse effect. Carbon dioxide, like glass in a greenhouse, allows sunlight to warm the earth but prevents heat from escaping back into space. The greenhouse effect could permanently raise temperatures on the earth, partially melting the polar ice-caps and causing floods.

All other sources of energy also have environmental effects. Nuclear power plants create thermal pollution and radioactive wastes. The construction of large dams changes river conditions. Electric power lines produce electromagnetic fields that may create a health hazard. Tidal energy plants change conditions along sea coasts and may disturb marine life. Geo-thermal power plants release heat and gases into the atmosphere. Any use of energy, no matter how clean the source, gives off waste heat. If the use of energy continues to grow, the heat released could alter the environment of our planet.

7. What To Do & How

Every one feels that there is a need for the restructuring of the electric power sector in the world, including the nation-states. But views vary on what should be done and how to do it.

Taking up the two traditional development models, (a) the government-owned and managed undertakings, known as the government-owned sector and (b) the market or corporate-capital-oriented enterprises, called the private sector, which have been dealing with the electric power sector since its origin in the world, India and Punjab, each one of the two models stands for monoplising money and power. The only difference between the two has been that, while the corporate capitalist-led one wants monopolisation under the capital owners, the communist-directed one opts for the monopolisation by the single ruling communist party. Also both hold that capital (or money or wealth) constitutes the most precious thing in human society and, hence, its growth represents the development, progress and prosperity in human society. Thus, in their search for capital, they don't care much for environmental sustainability or upholding of any human value. However, in their contention for supremacy, the communist model did lost in the competition and got liquadated around 1990 (though the ramshackled communist parties still hold on in many countries).

During the past one and a half decades, following the communist model's collapse, the corporate capitalist model has become the only model of the world or of all the nation-states, including India. In the Indian context, while it has attained the dominant position in almost every sector, the electric power sector (having been a part of the government undertakings for the last 55 years) is perhaps the last highly important enterprise to come under the corporate domain towards the close of the 20th century. But the experience of the states that have corporatised the electric power has been no better for the common people than that they had earlier experienced under the government-owned sector. While the latter (i.e., the government-owned) was marked by ever-mounting financial losses to the government and highly poor service to the consumers, the three year working of the former (i.e., the corporate companies) has been characterised by higher corporate profit and more costly power accompanied by poor service to the customers. A similar worldwide experience (with a few exceptions) of the corporate and the government-owned models shows that, despite their two outwardly different forms, they are marked by a similar inherent pro-capital and pro-political power nature.

Going by the foregoing facts, it becomes necessary for us to undertake the following four-sided task.

(a) The first part of the above-said task is to sort out the basic principles that should guide the electric power reforms process at three levels—international, national and regional (i.e., the constituent part, state or province, of a given nation-state).

(b) The second part of the above-said task is to raise the highly important issue of replacing the present technique of electric power generation from non-renewable fossil fuel sources (which create the biggest amount of pollution, endangering environment and all bio-life, including human, on our planet) by the technique of electric power generation from the renewable sources, like solar, hydal, wind, etc. (which are pollution free). However, despite having been the biggest threat confronting mankind, the question of pollution arising from the ongoing technique of electric power generation has received the least attention from the operators of the corporate system (comprising also its government sector,

(c) The third part of the above-said task is to prepare a practicable transitional arrangement that can smoothly carry the reforms process forward in India (as also in other nation-states) and its constituent provinces or states towards an environment-human based answer to the electric power problem at the central and state levels.

(d) The fourth part of the above-said task is to lay down a realistic strategy for building an environment-human centric electric power system.

Starting from part first of our task, this writing suggests the following basic principles that should guide the electric power reforms process at all times and places. These are: (a) To always uphold the principle of environmental promotion, on the one hand, and the supremacy of freedom, fair equality and rational conduct in human social development, on the other; (b) To replace the present anti-environment and anti-human non- renewable sources, such as the petroleum, thermal, nuclear, etc., generating 80 percent of the total world electric power by the renewable sources, such as the solar, hydal, wind, etc., in the next two years; (c) Supply of quality power to every type of consumer (including the BPL ones); (d) To supply power at the cheapest possible rates; (e) To arrange for

universal supply of power; (f) Power-cuts and other power restrictions at any particular time to be made equally applicable to all, irrespective of any political or economic distinction.

Looking at part two of our task, this writing is of the opinion that, firstly, it is necessary to rouse and moblise the people for raising the demand that, in view of the ongoing technique of electric power generation from the fossil fuels being the biggest source of pollution, all governments in the nation-states should, through proper research, replace the above referred technique of electric power generation by the new technique (already known to the experts) of electric power generation from renewable sources (such as solar, hydal, wind, etc.) within two years.

The second desirable step is to make an appeal to the UN for constituting a commission of energy and electric power experts that should, within a period of two years, suggest an appropriate technique of clean electric power generation from the renewable sources (i.e., solar, hydal, wind, etc.) at cheaper rates than the fossil fuels (i.e., petroleum, coal, etc.) which have become the principal source of creating the highest pollution in the world today.

Coming to part three of our task, this writing holds that, in view of electric power having been an object of critical nature (i.e., a matter, according to Physics, subject to abrupt changes) and a basic social resource, it should not be entrusted to MNCs which treat everything as a commodity (i.e., a thing that can be bought and sold in the market) and whose only motive is profit and nothing else. Instead, it (i.e., the process of electric power) should, within every country, be handled by a National Statutory Autonomous Electric Power Management Board (and a provincial or state board in each province or state), with no political or administrative interference from any government quarter and accountable to the concerned legislature. The boards will comprise the elected representatives from the following quarters: (a) concerned legislature, having 40 percent of members elected by it, (b) technical staff 20 percent, both mental and manual workers 20 percent and consumers, 20 percent.

The National Statutory Autonomous Electric Power Management Board will, after proper consultations with State or Provincial Statutory Autonomous Electric Power Management Boards, lay down the basic policy concerning electric power generation, transmission and distribution which will be binding for all.

At the state (or provincial) level, statutory autonomous electric power management board be setup in each state or province, comprising the same proportion of representation as at the national level, with no political-administrative interference.

The state or provincial statutory autonomous management boards would undertake the following measures with immediate effect: (a) To immediately start a dialogue with the workers and technocrats and assure them by giving a solemn undertaking that the reforms will not be at their cost, these will not be foreign-driven and be based on the interests of Indian people; (b) To get the political interference stopped altogether, including postings and transfers; (c) To stop the free supply of all types of power, except that (i.e., 100 units per family per month) given to those below the BPL category; (e) To stop wastage of power, including thefts, by all means; (f) To revise tariff rates, ensuring three percent minimum rate of return on the investment after providing the depreciation and interest charges; (g) To take up the question of introducing renewable sources of energy—solar, wind, hydro, bio-mass, etc., on the priority basis; (h) To motivate the workers, technical staff and board members for upholding the cause of clean environment and serving the interests of people by increasing efficiency and productivity; (i) To strengthen energy conservation and energy audit at every level; and (j) To negotiate with the government for the return of its loans in yearly instalments within a specified time.

Turning to part four of our task, this writing puts forth the below-noted brief version of the Nature-human Centric development model.

8. Nature-Human Centric Viewpoint

Concerning Capital

Nature-Human Centric Viewpoint holds that capital comprises a two-sided phenomenon, i.e., the environmental resources, on the one hand, and the human resources, on the other. This is because the environmental and human resources constitute the very life of human community, and, without them, nothing has any value in human society.

It firmly rejects the two concepts of capital, i.e., the liberal (corporate) theory of capital and the Marxian theory of capital. While the liberal (corporate) theory maintains that capital is the product of

four factors, i.e., technology, labour, raw material and capital, the Marxian theory considers that workers surplus value (realised by the capitalist through paying the worker less money wages than the actual value of worker's labour) represents the capital. In fact, both theories in practice hold that money or wealth and its growth denotes the capital. This is, because both liberal and Marxian theories are in agreement that development, progress and prosperity, whether (individual or collective), is represented by capital. That is why, in the entire world, all govt budgets, business accounts and individual incomes are accepted as the indicators of development, progress and prosperity.

9. Nature-Human Centric Development Model

Nature-Human Centric development model upholds two top priorities, i.e., environment and man and follows five basic principles, i.e., environmental promotion, fair equality (i.e., social security to every deprived and needy person and the rationalisation of irrational income differences in the proportion of 1:5), productivity (or growth rate), peoples-led democracy (empowerment of the people in place of corporate capital supported political parties and business circles) and all-sided transparency. This five fold fundamental principle corresponds with the bio-social nature of humankind, i.e., it co-ordinates man's self-interest with his social interest.

Nature-Human Centric development model represents the updated concept of development in contrast to the two traditional national development models, i.e., the corporate-led and the government-directed. While the corporate-led development model singles out profitability or productivity (which ensures the interests of money-owners alone) as its sole aim, the government-directed one opts for socialisation (or nationalisation) of the means of production as its only goal (which serves the interests of the ruling politicians and bureaucrats). Both these traditional national models serve only the self-interest of humankind contrary to his bio-social character, i.e., comprising both the self-interest and the social-interest. Again, they do not accord any priority to environment and any place to the upholding of democratic and transparent norms in the economic or growth process. Further, while the corporate model totally rejects the principle of equity (or social justice), the government-directed one fully ignores that of political equity and productivity,

Nature-Human Centric development model differs with both the corporate-led and the state-based development models on the issues of their purpose, management and style.

While the corporate model stands for developing the capital and capital-owners and the state model advances the interests of its ruling politicians and bureaucrats plus the labour aristocracy, Nature-Human Centric one serves the interests of people and environment, in general, and the poor and deprived sections, in particular.

In management, while the corporate sector upholds the monopoly corporate management and control and the state sector supports the monopoly bureaucratic management and control, Nature-Human Centric development model stands for democratic management and control of public limited companies.

In style, contrary to the authoritarian and secretive methods of corporate and state models, Nature-Human Centric development model stands for democratic, transparent and accountable style.

Nature-Human Centric development model holds that both the corporate and the government-led development models be demonopolised by taking the following steps.

All shares in the public limited companies be made ordinary shares. No one be allowed to own more than 0.5 percent of these shares. However, the state may, in special cases, be allowed to own one-fifth of the ordinary shares. The rule of promoters shares (now prevalent in the corporate sector) be totally abrogated. Every ordinary shareholder will have one vote, irrespective of the number of his ordinary shares.

The management of the public limited companies be made fully democratic. In this respect, the ordinary shareholders be given two-third representation in the management board. The remaining one-third representation be reserved for the concerned labour of a given company. The labour representatives be elected by both the blue and the white collar workers, having the same rights as enjoyed by the representatives coming from the ordinary shareholders.

The undertakings in which the government holds one-fifth of ordinary shares, the representation of ordinary shareholders and the concerned labour in the management board will be in the following order: ordinary shareholders 60 percent, labour 30 percent, government 10 percent.

The management board will be elected for a period of three years.

The above-mentioned democratic sector of Nature-Human Centric development model will be far more productive (may be twice) in contrast to both the monopolistic corporate and state-run sectors. The reason for the former's (i.e., the democratic sector's) high growth rate (or rate of wealth production) lies in its (i.e., Nature-Human Centric model's) greatly developed human and environmental resources due to its ensuring of equitable incomes with only 1:5 difference and providing of social security to everyone in all walks of Iife as a fundamental right; its fundamental principle holding people and environment as its main priorities; its adherence to global peace and security; its politics of peoples empowerment (particularly of women, workers and scientists-technologists) from the village to the UN level and all other economic, financial, and trading global institutions; its realistic and rational economics and its culture of human and environmental values.

As to the unviability of the government-Ied sector, it can be seen from the collapse of the former Soviet Union and the discarding of this model by the erstwhile socialist countries in the world. The ineffectiveness of the corporate sector can also be seen from the continuously rising graph of inequality, poverty, hunger, unemployment, houselessness, and above all, the continuing unsustainable crisis (now occurring hither and then thither) of the corporate model the worldover.

The increasing public demand for community (or public) control over the environmental and human issues shows the direction in which the human society is heading.

The corporate sector's newly-adopted stance of the philosophy of social accountability and ethical behaviour too reflects the unworkability of the corporate sector's fundamental theory of laissez-faire, which despises every social consideration in the economic development process and whose sole purpose is to maximise profit. February, 2005