DEVELOPMENT, ENERGY AND ENVIRONMENT:ALTERNATIVE PARADIGMS

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Should India repeat the energy history of the industrialized countries? History itself provides the answer. This answer lies in the pattern of change over the past century of a country's ”energy intensity, i.e., the amount of energy required to increase the value of goods and services by an unit amount.

In the case of USA for example, the energy intensity of the economy increased during its industrialization phase. Why? Because roads, railways, bridges, etc., had to be laid down, machines had to be constructed, building and factories had to be built, and a great deal of infrastructure had to be developed. All these economic activities required increasing amounts of steel, cement, non ferrous metals, chemicals, glass, and other basic materials. And, to produce all these materials, energy was required in growing quantities.

Eventually, the requisite infrastructure was built, at which stage, the energy intensity reached a maximum and there was a saturation in the requirements of these basic materials. Then, all that was required was minimal quantities of materials to maintain the infrastructure and to ensure replacements. And, the economy shifted from energy intensive basic materials to less energy intensive high value added goods and services. So, the energy intensity declined.

The changes in the energy intensity of the USA showed therefore a pattern ”it rose during industrialization, attained a maximum and then declined in the post industrialization phase. Is this pattern typical? Interestingly, UK, West Germany, France, Japan and other industrialized countries have all displayed the rise maximum decline pattern of USA. But, no country that industrialized after the USA repeated the exact values of energy intensity of the USA. In fact, ”the more recent the process of industrialization, the lower the maximum value attained by the energy intensity.

Why has the maximum value decreased? Because of two implications of the materials revolution. Firstly, the energy required to produce a unit quantity of a basic material has decreased steadily for example, the energy required to produce a tonne of steel today by the best technology is much less than what was used 50 or 100 years ago. ”Processes have become far more efficient. Secondly, the quantity of material to perform a given function has also decreased for example, the steel required to build a bridge is much less than that required in the past.” Materials have become far more efficient from structural and other functional points of view.

For both these reasons, a country can now industrialize with far less energy than its predecessors. Against this historical background, what options are there for India?

The first option can be labeled Copy the worst examples! and reflects a desire to emulate the early industrializers. Virtually every official speech on energy starts of by saying; the per capita energy consumption of energy in the USA is so much, whereas

it is only so little in India" meaningthat India must catch up with the energy consumption of USA. The desire actually derives from a particular way of looking at energy.

This pattern of thinking is the conventional paradigm for energy planning. According to this paradigm, development is equated with economic growth which is measured by the magnitude of the Gross Domestic Product (GDP). Then, the paradigm argues that the only way we can increase growth is by pumping more energy into the economy. So, we are asked to think in terms of energy consumption as a necessary condition for economic growth. Thus, the paradigm says that if we want development, then we have to have economic growth, and if we want to increase GDP, we must increase energy consumption (this is the so-called Energy-GDP relationship!).So energy becomes an end in itself and once energy becomes an end in itself, our main task is to answer the question: how much energy will be required in the future, say in the year 2000 or 2020?, i.e. we must make a demand projection. Once we make the demand projection, then we must start thinking about how we can increase the supply of energy to meet that demand. We must identify various energy sources to meet that demand.

A number of things are forgotten in this consumption directed supply sided process of energy planning the possibility of using energy more efficiently and of environmental impacts. We have also forgotten about whether the sources of energy that we are using are renewable or nonrenewable. Are we depleting them? Are we stealing them from future generations or are we using them in a renewable way? Nowadays, the lay public has become aware of these issues. Thus, no energy planner can get away with completely ignoring conservation and environmental impacts. So, what is being done by most planners is to first make a demand projection followed by a scheme for supply increases. Then, after the whole exercise is over and all the budgets are drawn up, the planners append a chapter on conservation stating powerfully how important it is to use energy efficiently and another chapter on environmental impacts saying eloquently that we must be very careful about the only earth that we have, etc. But, conservation and environmental protection do not come into the budget. They are afterthoughts and retrofits; their purpose is cosmetic.

This conventional paradigm on energy should be called the Growth Oriented Supply Sided CONsumption directed paradigm for which the acronym is GROSSCON.(Incidentally, according to the Oxford dictionary, "gross" means ”flagrant and "con" means ”confidence trick).If you scrutinize the statements on energy that is made by our ministers and planners, you are bound to find that almost all those statements illustrate this GROSSCON paradigm.

What are the consequences of using this paradigm? The conventional paradigm for energy is responsible for landing us in the environmental development trap that everyone is talking about. There are groups of people called ”developers who propose the goal of "development". In order to achieve their version of development, they must have economic growth and in order to have economic growth according to the conventional paradigm - they must have increases of energy consumption.

When, however, this energy is produced, there are a number of side effects, but like many modern doctors who prescribe "miracle drugs" without telling patients about the side effects of these drugs, the developers do not tell the people about the side effects of these energy projects.

One of the most important of these side effects is environmental degradation. People who see the environment degrading realize that our entire life support system is going to be ruined, and because they object to this disastrous result, they oppose the energy projects to prevent this environmental degradation. Thus, a conflict grows in intensity - the developers say that the environmentalists are preventing development and progress, and the environmentalists say that the developers and planners are destroying the environment making further development impossible and the development process unsustainable. The two sides are locked in battle. This conflict cannot be resolved within the framework of the conventional paradigm.

There are also other side effects two of which compel the formulation of an alternative paradigm. First of all, there are the ”mounting costs. It is becoming increasingly more and more expensive to generate that energy. Economists say that the marginal cost of power is increasing which means that it is more expensive to produce the next kilowatt than the previous one. That is because, as the easy sources get exhausted, we have to turn to the more difficult ones.We have to go from the easy dams and mines and oil fields to the remote dams in mountainous areas, the deep mines and off shore sources of oil.

Secondly, there is a human dimension of the problem. The people who are located at the site of these development projects may have to be uprooted. These oustees become the victims of development and they do not see the process as development at all. They see it as a process whereby a group of people the contractors and their allies - benefit from these projects whereas they become the displaced victims. This conflict is taking place over the Narmada and other projects. These victims then begin to oppose large energy and other development projects.

So the situation which the conventional paradigm has led us into is one of environmental degradation, mounting costs and conflicts with the people located at the site of the project. We have a situation where each side is accusing the other side. Those who want economic growth accuse environmentalists of opposing the progress of the people and those who are concerned with the environment say that developers are ruining the environment.

Clearly, India should reject this conventional paradigm for energy planning. This means that we must avoid comparisons with the early industrializers and we must avoid repeating the evolution of the energy systems of the early industrializers like UK and USA .If at all we want to copy the industrialized countries, we should ”Copy the best! We should emulate the most modern industrializers like France and Japan.

The emphasis should be on efficiency improvements so that for the same inputs of energy we can achieve greater increases of GDP "more GDP bang for a smaller energy buck". There must be a decrease of the coupling between Energy and the GDP, so that with less energy we can get more economic growth. Once there is reduced coupling between energy and GDP, we can choose environmentally benign technologies, and if we choose such technologies, then we have a positive feedback on development so that environmental concerns and development objectives need not conflict with each other. They can work together synergistically this is what is meant by sustainable development.

All this requires a fundamentally different paradigm for energy planning which I would like to call a DEFENDUS paradigm where DEFENDUS is an acronym for

”DEvelopment-”Focussed ”END-”Use oriented ”Service-directed. It is the only kind of scenario that can ”defend us in the present crisis.

The new paradigm or pattern of thinking insists that development necessarily requires increase of energy services, but not necessarily an increase of energy consumption. People do not want kilowatt hours, what they want is light when it is dark, heat for cooking, warmth in the cold, translational motion in transport, rotating shafts in machinery, etc. So, what is important is the ”services that energy provides, and not merely the consumption of energy ”per se.

The level of energy services is determined by the magnitude of "useful" energy; it does not depend merely on the quantity of input energy. That is, the level of energy services depends upon how much of the input energy is converted by the energy end-use device into what is useful. Thus, the useful energy depends upon two factors - the input energy and the efficiency of the end use device. Both factors come into the picture.

Why is this important? Because there are three well-known options for increasing energy services. The first one is the conventional GROSSCON paradigm - it says let your efficiencies remain as they are but ensure that you increase the supply and input of energy. So it is a completely ”supplysided approach. The second option is what many ”environmentalists are often guilty of: they also want increases of supply, but they distinguish themselves from the conventional supply siders by insisting that the supply should come from renewable and environmentally benign sources of energy, and not from the conventional centralized and environmentally malign sources. But, they too have fallen into the supply trap of the conventional paradigm. Then there are the other extremists - the ”conservationists who say that you don't have to increase the amount of energy, all you need to do is to increase efficiency.

According to the DEFENDUS paradigm, all these are extreme positions and we must reject all three of them. What we must achieve is a holistic integration of all these three options. What is required is an increase of energy services - the essential basis of development through a ”mix of efficiency improvements, decentralized renewable sources and centralized sources.

Better still, because India has not yet completed building its infrastructure, we should go in for technological leap frogging and achieve even lower maxima than France and Japan. How? By adopting technologies of energy production, distribution and use that together make the economy even less energy intensive than Japan. That is, we should ”Beat the best industrializers!

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