Energy Economics and Policy
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Week – 01
Energy as an Economic Resource
Lecture – 01
Introduction

A very warm welcome to the course Energy Economics and Policy. In this course we are going to look at the economics that runs behind energy with respect to demand, with respect to supply; what does the energy market look like? What is the genesis of energy economics? and so on. So, I welcome you all to the course and I hope you are going to enjoy it a lot and learn a lot of things about energy economics during this course over a period of 8 weeks.

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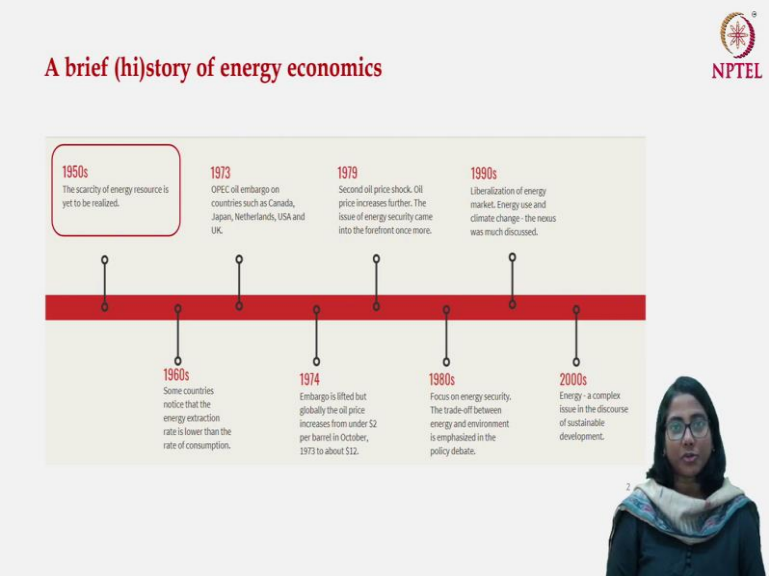

Let us begin with a bit of history because when we talk about energy economics, the first thing that should strike us: ‘when did the marriage between energy and economics actually take place?’. So, it has a little bit of history in it. But before going into that, let me ask you what do you understand by ‘economics’? You may have different answers with you, but let me tell you that economics at the very basic level always deals with a resource which has ‘scarcity’.

We say that economics is the discipline, which deals with ‘optimum allocation of scarce resources'. So, the moment a particular resource is recognized to be scarce, i.e. there is demand

excess of supply, there comes the role of economics. You will see, as we go on and talk a little bit about the history of energy economics, this is the same background that energy economics shares with other branches of economics.

Let us go back to the 1950s. At that point of time probably you don't see much writing on energy economics directly because energy was not recognized to be a scarce resource at that point of time. So, whatever quantity was demanded by households, by industries, it was quite well met by the power supply sector or by the energy supply sector.

So, we write here that in the 1950s the scarcity of energy resources was yet to be realized. It was yet to come on-board. What happened in the 1960s? In the 1960s, people started realizing bit by bit that something was not going really correct. Whatever electricity especially or the energy that was demanded was not being quite met and this was well documented in the context of many of the developed countries, especially in the context of the US.

So, what was the experience of the US in the beginning, and especially towards the middle of 1960s? The power supply and manufacturing industries industries in the US actually realized that something was going wrong with this regard. What was going wrong? So, the power supply sector was in a position where they were unable to meet the demand for electricity that was coming from the household as well as the energy sector and the industrial sector. So, what was all about it? The power supply sector actually wanted to increase their supply, but they had two fundamental challenges. One, in order to produce more power they actually required a bigger capacity and to install a bigger capacity they were actually looking at the industrial sector.

However, the industrial sector i.e. the manufacturing sector, they were not able to produce that many equipment at a point of time and this was one problem. So, there was a problem in terms of machinery that was being faced by the power generation sector. What was the other problem? The other problem that they faced was that, even if the capacity was there, they did not have enough fuel to produce electricity. So, there was a challenge in terms of capital as well as in terms of fuel and raw material that was faced by the power supply sector, especially in the developed countries.

Why did this happen? This happened because the manufacturing sector was also at a very difficult position as the demand for machinery from the power sector was increasing. The manufacturing sector was not being able to keep a pace with that because that kind of growth in demand was suddenly unfamiliar to them at that point of time. Now if you look at the growth

rate of energy demand at that point of time in the developed countries, you will see that in the US, it started crossing the historical trend of 6% to 7% increase of power demand per annum. So, that was quite a difficult and quite a new kind of situation for the power supply sector.

There was one more thing that happened. Because of the environmental concern, the US and the other developed countries, they actually started importing the raw material, which is oil, from the Arab countries. Because they found out (again an environmental concern) that the oil that they can actually procure from these Arab countries has much less sulfur content and therefore, much more environmentally-friendly.

So, this, what did they start doing? They started replacing their indigenous stock of coal and oil and started putting the imported oil in as the fuel in the power generation sector. So, two things happen at one point of time and a hint of a third one. The first thing, the domestic demand shot up, the second thing, there was an increase in the dependence on other countries. So, import shot up and slightly you are getting introduced to the concern of the environment and the third thing is that you are gradually getting introduced to the concern for climate, not only climate, I would say for the environment, at that point of time.

So, what was the cause of this growth in domestic demand at that point of time? It was basically an increase in population and also an increase in the rate of industrialization. In the 1960s, another big thing happened in the case of energy supply; these Arab countries who found oil and started exporting oil all over the world formed their own organization called OPEC, which is the Organization of Petroleum Exporting Countries. And gradually they realized that they have a certain kind of monopoly power in the supply of oil because there are not many other countries who were producing oil at that point of time. So, they would actually have monopoly power on oil and they had a control over the price.

So, you see, gradually you start understanding that there is a scarcity with respect to the resource, which is called ‘energy’ and therefore, the need for economics as a discipline to penetrate in order to understand the optimization or optimum utilization of that resource came into the picture. This is the scenario in the 1960s. You know certain hints were coming, but nothing big happened at that point of time. But then comes the 1970s which is a turning point or a rupture point in the history of resource economics, in the history of energy, and in the history of energy economics, I would say.

So, what happened in the 1970s? In the early 1970s certain developed countries including Europe, many European countries, US, Netherlands they all engaged into a war. They didn't directly engage into the war, but what happened is that the Arab-Israel war, which is called the Yom Kippur war, was going on between Arab countries and Israel. And this set of developed nations, especially the US and certain European nations supported Israel in this war. So, what did the Arab countries do? The Arab countries actually said, okay fine, you support Israel in the war, what we are going to do is to pose an embargo on you with respect to oil supply.

Now by that time oil has become a lifeline of all the economies. So, suddenly if the supply is stopped, everybody is in a very very difficult situation. So, what happened as a result of this embargo that was set by the Arab countries?

As a result, you would see that within a span of 1 year, the price of oil shot up from 2 dollar a barrel (so note it: 2 dollar per barrel) to 12 dollar per barrel. There was a 6 fold increase in the price of oil and although the embargo was directed to a set of developed countries, the impact was felt all over the world. Everybody suffered and everybody and economies suffered from this sudden increase in the price of oil.

That was the beginning when people realized that something is going on very very wrong. First of all there is a scarcity, second of all oil is emerging as one of the fundamental energy and the third is that there is a monopoly power with respect to the supply of oil. So, that was the story in 1973. What was followed immediately the next year, 1974, the embargo was lifted out, but as I have said. So, here you can see, as I have said, that although the embargo was lifted out, the price rise already took place.

That was the beginning of the 1970s and that was actually the turning point of the history of energy economics. A lot of literature came up at this point in order to understand various issues, in order to understand what the market structure, within which the energy is operating, in order to understand what the sources of demand are, in order to understand the supply constraints, also to understand what the substitution possibilities between different fuels are. So, if I want to, for example, substitute imported oil by domestic coal, what are the options? Because, once some industries are already set up it may not be very easy to switch the fuel from oil. It sounds very easy, but it may not be very easy as the technology may be well specific to oil and not to some other resources.

So, that is the juncture at which energy economics took the real shape and it followed various different avenues within the branch of energy economics.

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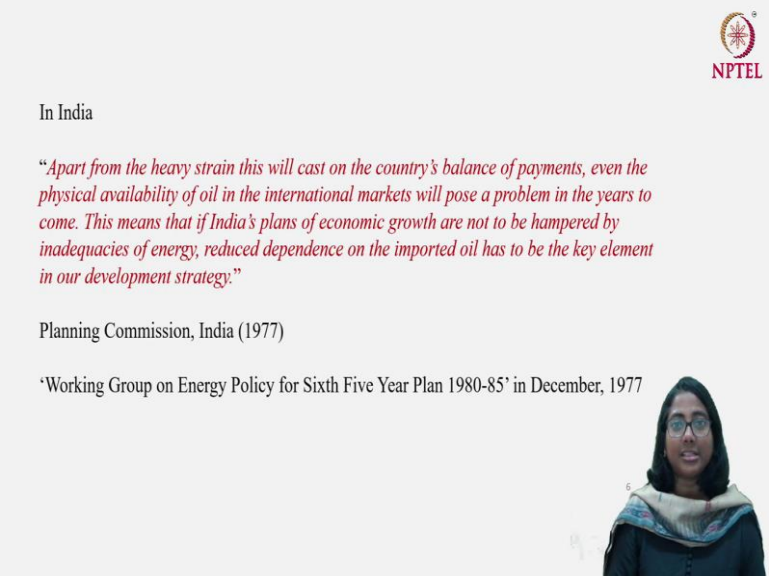

Before we go on to discuss 1979, we'll just have a quick look at what was going on in India. India, as I have mentioned, although it was between the Arab countries and some developed nations, the entire world actually felt or suffered the consequences of the increase in oil price and India was not definitely out of the whole domain.

So, what happened in India? In India, the Planning Commission...see, in India up to the 4th Five Year Plan there was no discussion going on with respect to energy. So, you can imagine at that point of time we didn't realize that some supply constraint was going to emerge or we never talked about environmental concerns and so on. So, it was very sublime in the whole domain.

In, during the 5th Five Year Plan you start feeling sort of the tension in the energy sector and therefore, the government becomes really active. So, the government said we need to understand what are the substitution possibilities? Can we actually survive without the imported oil? Can we actually survive on our own coal? What kind of reserve do we have to maintain? What is the elasticity if suddenly the price goes up, what is going to happen to my demand? What is going to happen in my supply and so on, what is the geopolitics that is going on?

So, there was a lot of concern that suddenly emerged, also in the context of India. So, not only in India but in many countries you will see that a lot of repercussions happened as a result of the increase in the price of oil. So, there..here I quote from the Planning Commission in 1977, 'apart from the heavy strain this will cast on country's balance of payment even the physical availability of oil in the international markets will pose a problem in the years to come. This means that if India's plans of economic growth are not to be hampered by inadequacies of energy, reduced dependence on imported oil has to be the key element in our development strategy', immediately the question comes: who is going to substitute the imported oil? Of course, its domestic coal. So, you see a lot of literature coming up in India as well, in the late 1970s, early 1980s who are talking about the substitution possibilities between different fuels. So, following this in the year of 1977, in December 1977, a Working Group was set up on energy policy for the 6th Five Year Plan which was spanning through 1980s to 1985.

Coming back to the 70's again. 1970s was full of incidents that shaped the whole domain of energy economics. What happened toward the end of the 1970s? In 1979 there was something going on which was very domestic for Iran. There was a political upheaval going on in Iran; however, what happened there was a decline in the supply that was coming from Iran again with respect to oil. So, this was nothing to do with OPEC, but this was basically some reduction in the supply from Iran. Now, see what happens if you have already experienced something which is very very bad; you become, your precautionary measures become too stringent. So, in 1979, well, when the world got a hint that Iran may reduce the oil supply, everybody became very very alert and everybody started to procure as much energy as they could. As a result the oil market got a second shock. Second time the supply actually fell far below the demand and there was a second round of shot up in the price of oil.

Now, if you look at the literature at that point of time, it's very interesting that the experts are actually saying that see you didn't have to be so worried about it because it was not so bad a situation. The reduction in supply from Iran that was there, but that would not have impacted the world so badly. But everybody got very very alert because they already faced the consequences of the previous oil price shock. So, everybody wanted to procure more and more oil. So, it was mostly a precautionary demand that created the difference between demand and supply. So, it was not the actual demand, it was actually the precautionary demand that was creating a role to play.

So, you can see that, as we progress, as we move on, on our timeline there was a gap in demand and supply that was being created. So, demand was higher, supply was less, as a result the price was shooting up and what does it signal to? It signals that there is a scarcity of energy. So, energy is gradually becoming a scarce resource and therefore, you need 'economics' in order to manage or in order to understand, what is the optimum utilization of this particular resource?

So, the turmoil that we actually faced in the 1970s throughout the 1970s continued in the 1980s because oil prices continued going up. There was a bit of stability, again it went up and so on. However, the world also realized, see if you look at the what the government of India said that we really need to rely, we really need to think about the replacement of imported oil. So, the moment you talk about replacement of imported energy, you are talking about energy security. So, if I am importing the oil from some other country and my all my economic activities, my manufacturing, power supply sector etcetera they are wholly dependent on this kind of import and tomorrow if somebody denies this import, then I mean denies to export me. So, if I don't have the imported oil my all economic activities will stop. So, I don't have any security with respect to my energy supply that I can ensure only if I have domestic energy or I am importing energy from some country which is geopolitically very very stable and I share a good relation with that particular country. So, you will see a large volume of literature in the context of the energy economy that started arising in the 1980s, which talked about energy security and which actually talked about the geopolitical situation, how geopolitics will shape energy security.

There is one more interesting thing that came up at this point that is the nexus or trade-off between energy and environment. So, do you think the use of all kinds of energy is actually environmentally friendly? What is the trade off? You use oil, you can use coal. So, you can say, okay coal is my domestic resource. So, I am more energy secure if I am using coal and not oil; however, if you use coal you are actually generating a lot of pollution which may not be generated from oil. So, you see there is a trade-off between energy and environment. So, this is another discussion which came into the force in the 1980s and gradually you will see as you move along, this discussion is moving from only energy environment to energy environment and climate change. Because the use of energy resources this accounts for the emission of greenhouse gases which are causing the change in the climate.

Next comes the 1990s. The energy market, the structure of the energy market, actually had undergone great changes during the 1990s. Before this we would see that most of the power supply sector, the energy generating sectors, were owned by the states. So, the energy market

was initially dominated by the state because the state believed that it actually was creating a lot of public benefits. However, in the 1990s you will see that there was a move towards liberalization, market economy penetrated also in the context of energy economics and as I said here also you see that the energy use and their relationship between climate change and environment became very very prominent in the 1990s.

We will stop to see what happened in the 1920s. So, the discussion went on in all these directions and as we go on you will see the discussion in energy in the context of economics became very very complex and diversified. So, there were a lot of things which were being discussed and the other thing which is very important to note is that it's very important to have multidisciplinary or interdisciplinary research in energy economics. So, even if you are talking about energy economics, it's not only economics that you are talking about, you need to understand certain technology, you need to understand what is going on in the industry.

So, recently in the world you will see there are a number of energy-studies groups which are emerging and they have, you know, people from engineering backgrounds, scientists, economists, sociologists. So, there are various facets of the problem, although we are calling it energy economics, but it's probably only a part of the whole problem. So, you need many people from many disciplines in order to understand and solve the problem related to energy.

I am going to stop here with respect to the timeline, you can always post me any questions that you have or any reading that you want to go through, but before finishing off with this, the first lecture, I will just quickly introduce you to the modules that we are going to cover over the span of 8 weeks that are coming with that we are going to spend together with this course.

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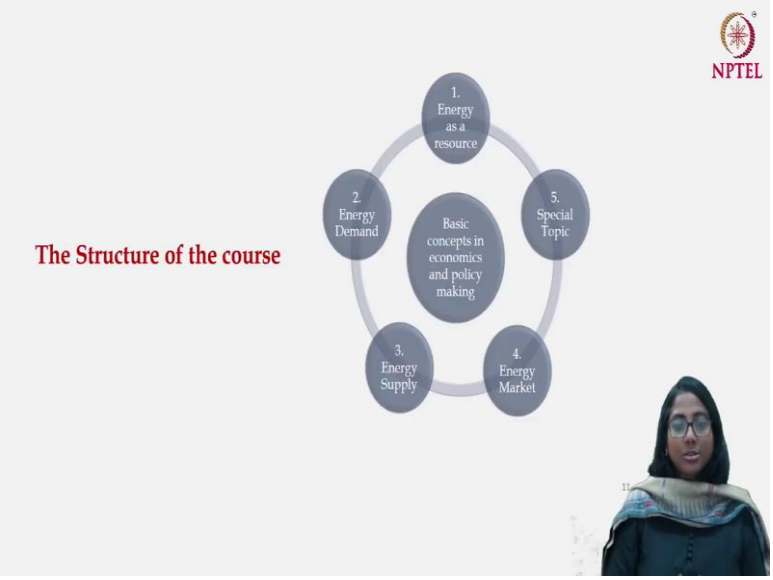

So, this looking at the structure of the course, you see all five modules y will revolve around some fundamental concepts of economics and policy making, right. So, what are the modules we are going to cover? The first one we are going to talk about is energy as a resource or better mentioned I should say this is all about energy as an economic resource, okay. The second one is energy demand; the third one is energy supply.

So, in energy demand we talk about the individual demand for energy, we also try to analyze what is the energy demand of a particular country and both at the macro as well as the micro level and we also talk about how the demand can be managed, what is the what are the different policies that are there in order to demand for demand management. We will also talk about certain behavioral issues as well, right. This is the plan for energy demand.

In case of energy supply we will talk about the general supply behavior of the producers and we will talk about how precisely the producers of renewable energy as well as non-renewable energy behave, how does the market look like? And this discussion actually continues in our 4th module where we talk about the energy market which has some very specific features. So, if you look at you know electricity or any other energy market none of them are perfectly competitive markets, where the, only the demand supply interaction determines the price, there are many other factors that play very very crucial role. So, we are going to talk about that.

In the final module that is module 5, we are going to cover some special topics for example, energy security or, for example, what is the, you know, the tradeoff between energy

environment and climate change and so on. So, this is the scheme of our.. the scheme of this course, please stay with me for coming eight weeks. We all together will learn a lot and anytime you have a question, please feel free to post that question and I will be ready to answer those.

Thank you very much.