Energy Economics and Policy
Prof. Shyamasree Dasgupta
Department of Humanities and Social Sciences
Indian Institute of Technology, Mandi

Week - 05
Energy Supply - Part II
Lecture – 03
Economics of Renewable Energy Supply

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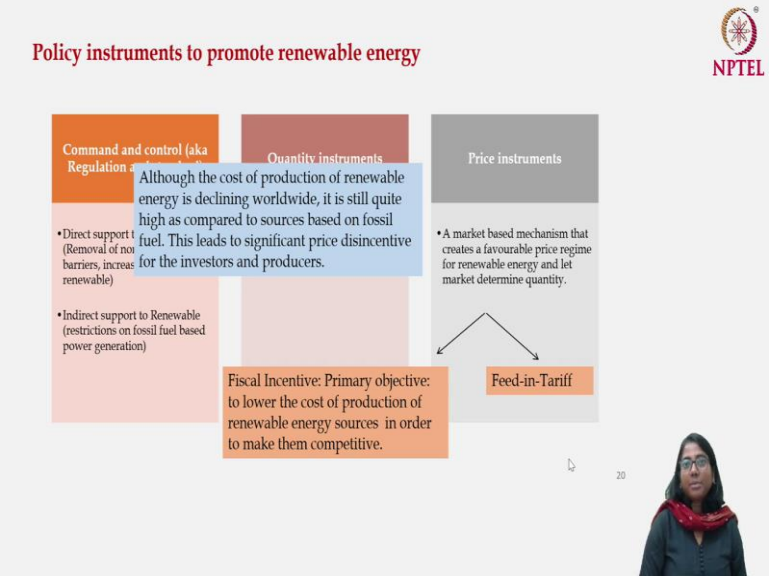

Next, we move on to the price instrument. These are the market-based mechanisms that create a favorable price regime from renewable energy and let the market determine the quantity. It follows up from the discussion that although the cost of production of renewable is falling a lot and there are a lot of investment activities that can be experienced, the cost of producing power from renewable is still quite high as compared to the conventional sources. Therefore, comes the role of the price instrument where it tries to make the playing field level for both renewable and the non-renewable.

Under the price instruments we are going to discuss Feed-in-tariff and the fiscal incentive. The primary objective of fiscal incentive is to lower the cost of production of renewable energy sources in order to make it more competitive. The term fiscal means budgetary, something which is related to tax and subsidy. When the government gives tax credit or subsidy, they come under the fiscal incentive but this is generally the meaning of fiscal related to budget.

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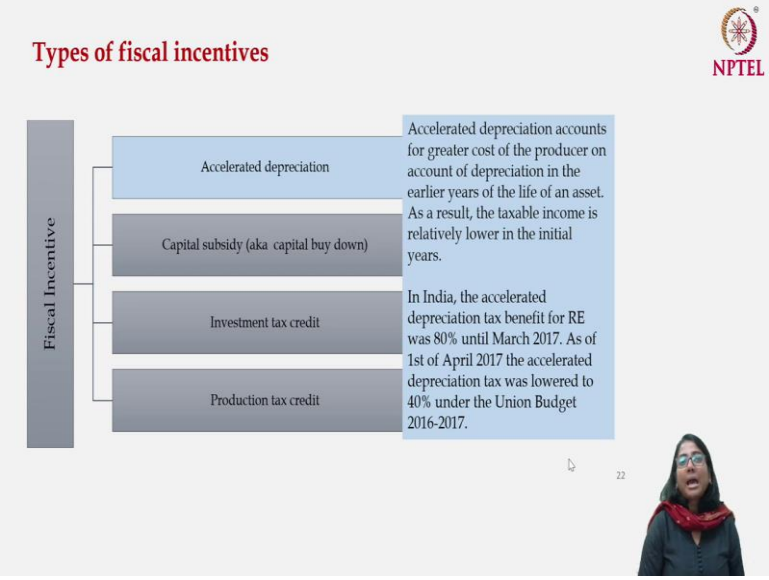

There are various instruments that fall under the umbrella category of fiscal incentive. It starts from accelerated depreciation to capital subsidy which is also known as capital buy down, it can be investment tax credit or it can be production tax credit as well. We will take up all the instruments one by one and we will spend some time on each of them.

We begin with accelerated depreciation, so what is depreciation? Depreciation is the money that is set aside by some industrial firm in order to capture the wear and tear of the machinery. Suppose today I invest some money in order to buy a particular machine whose lifetime is 10 years. After 10 years this machine is not going to work anymore because of the everyday wear and tear that is happening. If that is the case then for every day's wear and tear the company is setting aside some amount of money which is called the depreciation and which is calculated as a part of the financial cost of the company. When the tax is calculated it is calculated on the earnings of the firm, you can show a part of your earnings as a cost. The part of revenue that you are earning which is being accounted for depreciation is a cost. As a result, you are left with less amount of revenue which is taxable. If you can show the increased depreciation during the initial years of the machinery then during those initial years you are going to get some tax benefit. The accelerated depreciation accounts for greater cost of producer on account of depreciation in the earlier years of the life of an asset. As a result, the taxable income is relatively lower in the initial years.

How does it help the investor? The investor knows that if the time period over which he or she

is going to get back the investment is longer than it's good to have accelerated depreciation which shows that your cost is also higher in the initial period as a result net revenue is lower and taxable income is also lower. One is paying less tax in the initial years if one can show a greater rate of depreciation of assets during the initial years and that is somewhat logical because when machinery is purchased it is more heavily used in the initial years. The wear and tear is expected to be happening more in the initial year therefore accelerated depreciation has both economy as well as technical grounding in itself.

In India the policy of accelerated depreciation was to the tune of 80% accelerated until March 2017 that is in the first year one can show 80% depreciation and get the tax benefit accordingly. However, that was reduced to 40 percent in the post 2017 period, now the accelerated depreciation has come down in India. There was a lot of controversy at that time regarding the effect of reduction in accelerated depreciation.

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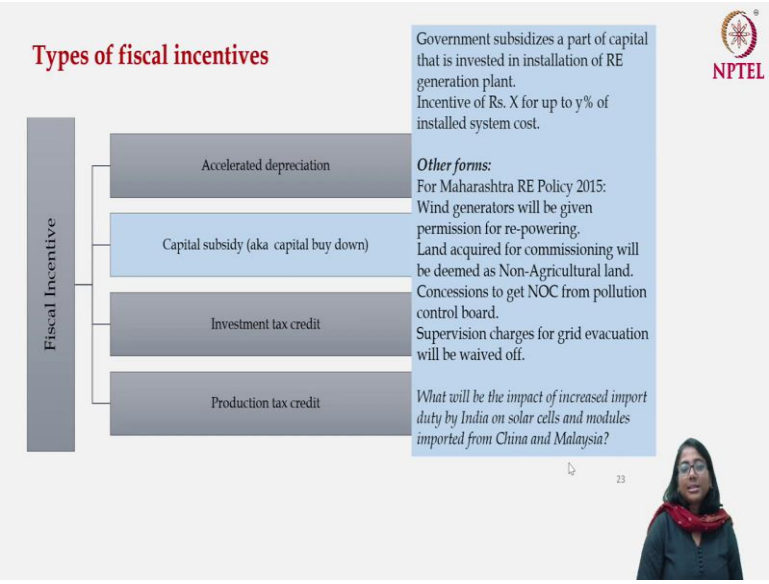

The second one that we are going to talk about is the capital subsidy which is also known as capital buy down. Capital subsidy is that the government subsidizes a part of capital investment for the installation of renewable energy generation plants. If I want to invest in renewable energy generation, then the government will give me some amount of money, say rupees X for up to Y% of installed system cost. Suppose, my installed system cost is 1000 rupees, then the government may say that I am going to cover 2% of 1000 rupees up to a kind of ceiling. This is subsidizing the investment that is the capital subsidy.

Although we are talking about fiscal incentives which have to do with tax and subsidy but there can be other forms of incentives as well. For example, again if you go back to Maharashtra Renewable Energy Policy documented in 2015, the wind generators other than capital subsidy were given a lot of facilities when they started their investment. It was said that the wind generators will be given permission for repowering. The land acquired for commissioning will be deemed as non-agricultural land which is much easier to procure. The concessions will be given to get the no-objection certificate from the pollution control board and so on. Fiscal incentive is one form of easing the process but there are other forms as well and many a times there are multiple instruments working together in order to promote the renewable energy generation in the country.

Another point which caused a lot of debate in the recent years in India is that India actually imports a lot of solar cells and modules from China and Malaysia and Indian government a couple of years back imposed an import duty on the solar cells and modules imported from China. The question is what do you expect the impact of this policy is going to be on the uptake of or the energy production based on renewables? The logic behind putting this import duty was that the government actually wanted to sort of energise the domestic production sector under the 'Make in India' initiative and discourage the import. But in the short run what is going to be the impact of this kind of a policy on the renewable energy supply in India? This is just a food for thought, you can think about it later.

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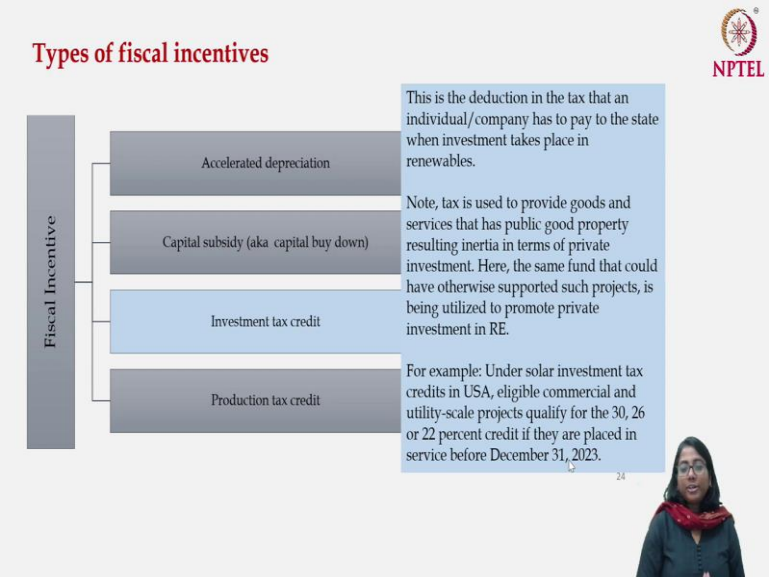

The third option that we are going to talk about is the investment tax credit. Under capital subsidy we have seen that the government is actually paying some money in order to subsidise the capital investment. Here the government is making a deduction in tax that an individual or company has to pay to the state when investment takes place in renewables. Instead of paying the money in the form of tax to the government they can use a proportion of money in order to set up the renewable energy supply system. You are getting a tax credit because you are investing in something which has a public good property. Here again we come back to the discussion of public good and private good that we initiated at the beginning of this week.

When the tax is collected by the government partly the objective is income redistribution but majorly when you collect the tax, this amount goes into the investment which has more of a public good property. For example, to set up a school which has a public good property because the benefit that the school creates cannot be captured in the revenue generated from the school. The impact is far reached. It has a significant impact on the locality but this kind of benefit is a social benefit which is not captured in the private benefit curve. In case of this kind of public projects often the government uses the tax money to promote these public projects. For example construction of roads is also a public investment.

If you think about the renewable energy supply, once the renewable system is there it is not only producing electricity but it is also producing certain other co-benefits. We have already discussed that during the lifetime of energy generation of renewable energy the carbon dioxide equivalent that they produce for per unit of power generation is much lower as compared to the non-renewable energy-based power generation. But this kind of benefit is difficult to be captured within the private benefit. Therefore, the investment in renewable energy projects has certain public good characteristics. The government is saying that instead of giving the money in the form of tax, invest that money in the renewable energy generation which is again sort of a public project.

In India we do not have investment tax credit in place. The most prominent one is the solar investment tax credit in the United States of America and the eligible commercial and utility scale projects qualify for 30 percent, 26 percent or 22 percent credit if they are placed in service before a stipulated time period.

For the current cycle they have to place their services before December 31, 2023 and if they can do that, they will be getting the tax credit of 30 percent, 26 percent or 22 percent. We see

that the capital subsidy and the investment tax credit are designed in a manner so that the investors are more inclined to invest in the renewable energy projects.

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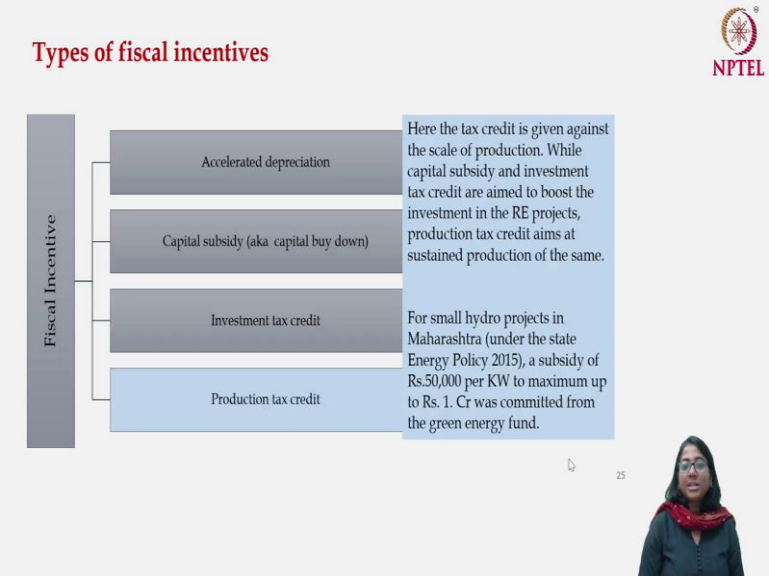

The next one is the production tax credit which just follows the investment tax credit. Here the tax credit is not given for the investment rather the tax credit is actually given depending on the level of production. If you produce more then you will get more tax credit maybe with some upper boundary.

While capital subsidy and investment encourage to break the first barrier, the production tax credit actually tries to encourage a sustainable production of energy from renewable sources. We again come back to Maharashtra Energy Policy 2015 which is actually a very vibrant policy where for small hydro projects a subsidy of 50000 per kilo watt to maximum up to 1 crore was committed from the Green Energy Fund is an example of production tax credit.

In a nutshell these are the different types of fiscal incentive. There can be other forms of instruments. For example, if you again go back to the Renewable Energy Policy of 2015 of Maharashtra, we will see a subsidy of 50000 rupees per kilo watt was given to small hydro projects and the maximum amount that was payable to them was 1 crore. This is the kind of production tax credit that we have in place in many other states as well. In a nutshell this is the framework of fiscal incentives that are in place, there can be other instruments as well under fiscal incentive but broadly these are the main mechanisms that you can see.

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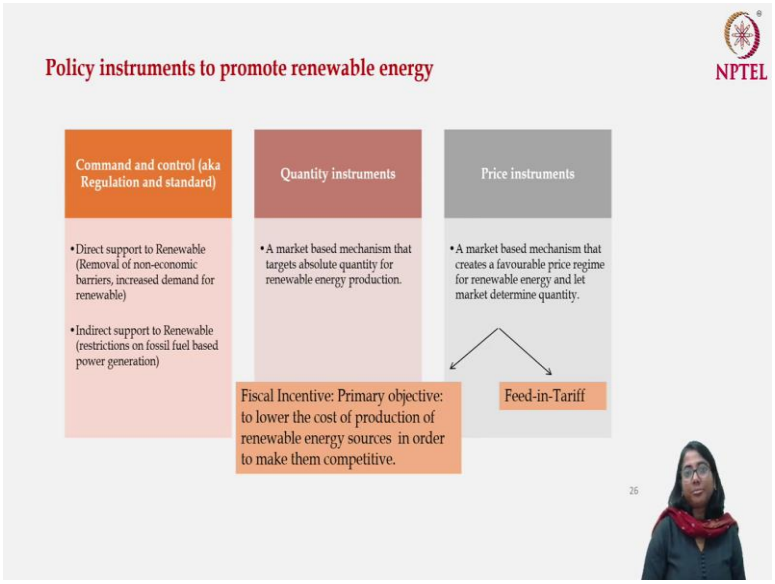

Finally, we come to the last instrument that we are going to discuss which is the Feed-in-Tariff which is again quite popular in India and most of the states follow the mechanism of feed-in-tariff.

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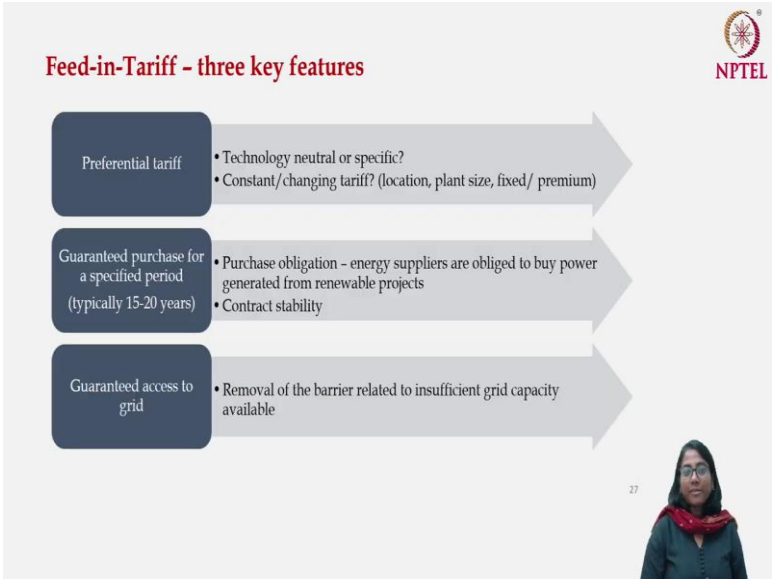

Let us have a quick look at what is feed-in-tariff? There are three key features of feed-in-tariff, the first one is preferential tariff, the second one is called the power purchase agreement. This is the guaranteed purchase agreement of renewable energy for a specified period of time and the third is guaranteed access to the grid.

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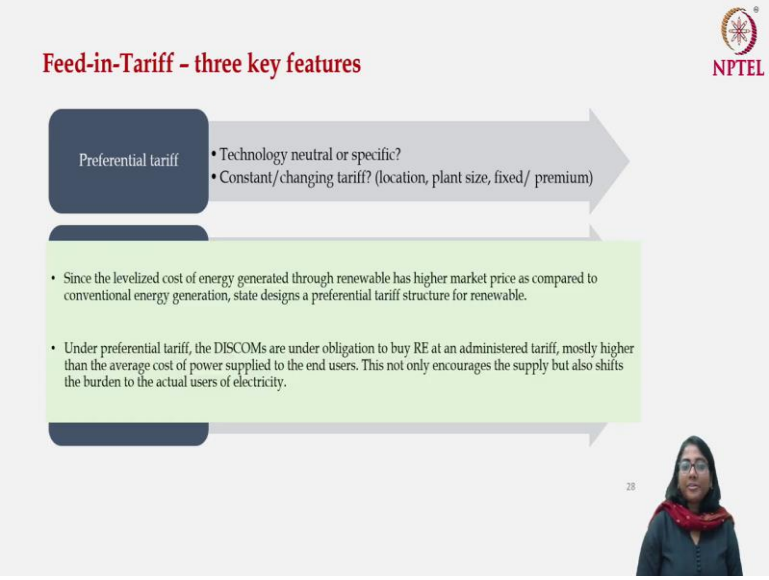

Under preferential tariff since we have already discussed that the levelized cost of energy generated through renewable has a higher market price as compared to conventional energy generation, the state has to design a preferential tariff structure for the renewable. The DISCOMs or the utilities are sort of quote unquote forced to buy this renewable energy-based power at a higher price. The price is higher but there has to be some mechanism to buy the power.

However, in case of feed-in-tariff the quantity is not being determined. The government is not setting any mandate on how much renewable energy to be produced or what percentage of energy supply has to come from renewable energy. There is no mandate with regard to quantity, the mandate is only with regard to the price. Under the preferential tariff the DISCOMs that is the distribution companies are under the obligation to buy the renewable energy at an administered tariff mostly higher than the average cost of power supplied to the end user. This is not only to encourage the supply of the power but also ensure that the burden is actually shifted to the actual user of utility and not all over the taxpayers.

When we talk about preferential tariff, there are two questions which are addressed. The first one, is it technology neutral or is it technology specific. Are these tariffs similar for all technology for example solar, wind, geothermal, biomass and so on or are they going to follow a different mechanism of price determination for the administered price for different technology. These are the things that are usually talked about when you think about the policies

to promote renewable energy.

The second is that is it a constant tariff or is it going to change over time across the location, across the plant size. These are the two questions that are usually addressed when the preferential tariffs are determined. The second component of feed-in-tariff comes in the form of guaranteed purchase for a specific period of 15 to 20 years. This is important because once the preferential tariff is set it is known that today the energy that renewable projects are producing will be sold in the market at a particular price but what is the guarantee about the years to come.

It is also important that there is some contract stability over a period of time. When I am investing in a renewable project, I know that there is not only demand for today and tomorrow, the demand will also be there 20 year down the line. These purchase obligations are very important in order to make the feed-in-tariff successful. The energy suppliers are obliged to buy the power generated from renewable projects over a period of time not only for 1 year or 2 years but maybe for 15-20 years and the price is also fixed at the beginning.

The third one is the guaranteed access to grid, so the feed-in-tariff mechanism also takes into consideration the importance of removal of barriers related to insufficient grid capacity available. This is where we are going to stop and I will see you during the next lecture.

Thank you.