Speech of Sh. Sushil Kumar Shinde, Hon'ble Union Minister of Power, India, for CSLF Meeting on 4th April 2006

Dear Chairperson, Distinguished Delegates, Ladies& Gentlemen

I extend a hearty welcome to all of you. We have assembled here today to discuss an important topic i.e. carbon sequestration which holds potential for meeting our energy needs in a better way in future.

Meeting its energy requirements is a priority objective of every country. But it is also equally important that this is done in a secure, efficient and cost effective manner. This aspect becomes all the more critical for the developing countries like India where the living standards have yet to come up to the world average levels and a large segment of population is to be provided with access to modern commercial energy. It has been recognized internationally that development and poverty reduction are urgent and overriding goals. We, in India, have also planned to increase our energy production capacities so as to meet the projected demand in order to realize our development potential. I am happy to inform you that the Government of India is implementing an ambitious nationwide programme to provide access to electricity to all the households by the year 2009. At present, about 56% of our rural population i.e. 78 million households do not have access to electricity.

Our energy needs in future are going to grow rapidly. By the year 2012, meeting the demand for electricity will require an installed capacity of more than 2,000,000 MW which is 60% more of what we have at present. It is further estimated that by 2020, our requirement will be of the order of 400,000 MW. We require energy in such large quantity as our economic growth is accelerating, coverage of households is targeted to grow rapidly, and we also aim to increase per capita consumption of electricity to 1,000 units by year 2012.

Obviously, meeting such huge energy needs would call for exploitation of all available energy resources. We have come out with a National Electricity Policy that aims to exploit all possible resources to meet the demands of electricity in an efficient and cost effective manner. The policy gives highest emphasis to development of clean

sources of energy like hydro potential. We are also developing non-conventional sources of energy and endeavour to exploit nuclear energy. To meet the projected energy demands, which is imperative for our developmental needs, fossil fuels particularly coal is going to be mainstay for generation of electricity in India.

We have set a priority for developing cleaner sources of energy like hydro power and other renewable and non-conventional sources of energy. It must be recognized and is gratifying that there is growing appreciation of the fact that the hydro power projects regardless of their size are renewable sources of energy. They also address environmental concerns on climate change.

At present, about 26% of installed capacity for electricity generation in India is from hydro power and about 66% from thermal generation including gas. Nuclear energy constitutes about 3% and non-conventional energy sources, of which wind energy is predominant, constitute about 5%. This does not include captive capacity of about 41,000 MW.

Share of hydro power in the total installed capacity was about 50% in 1960s. This came down to about 24% but we could succeed in reversing the trend in 2003 and now it is 26 %. We have recently launched a 50,000 MW hydro initiative, which aims at developing the available hydro potential of the country rapidly. But on account of overall large energy needs and also the fact that development of hydro power projects take longer time the share of hydro power in total energy scenario may improve but not to the level that had been reached earlier.

We have a separate Ministry for promoting Non-Conventional Energy Sources. Good progress has also been achieved in promoting these sources. Renewables, other than hydro projects, constitutes about 5% of the grid connected generation capacity. We feel this is a sufficient achievement for a developing country like India. We have fifth largest installed capacity for wind energy in the world.

Continuous efforts are being made to promote renewable and non-conventional energy sources. But the cost of energy generated from many of these resources is at present very high. Efforts in research and development in these technologies are urgently required so that a breakthrough in reducing capital costs is achieved to make these sources more and more affordable.

Genuine concerns about energy security make it imperative that fossil fuels are going to be dominant source of energy in India like in many other developing countries for medium to long-term. In this context, nuclear energy also needs to be promoted.

Continued use of fossil fuels for meeting the energy needs has raised concerns about climate change and particularly global warming across the world. We share these concerns. However, it is important to keep the perspective in view. Per capita emission of carbon dioxide are the highest in high income countries. According to the published statistics, carbon dioxide emission per capita in India is around 1 tonne against the world

average of about 4 tonnes and of about 19 tonnes in case of some developed countries. Development needs of developing countries have been recognized globally. Such development process will necessitate consumption of higher levels of energy. While discussing the concerns on issues like climate change and global warming, it will not be equitous to put together countries with comparatively low per capita emissions and whose large population are yet to see the fruits of development and respectable standard of living with countries which are already developed and have very high per capita income and still have ever growing energy consumption. Efforts should be to achieve a unit of human welfare with least possible energy consumption.

This brings us to the importance of energy efficiency and energy conservation. Lowering energy intensity of GDP growth through higher energy efficiency is key to meeting India's energy challenge and ensuring its energy security. India's energy intensity vis-à-vis GDP growth has been falling and is about half what is used to be in early 1970s. Energy consumption, per unit of GDP in purchasing power parity terms, is only 0.19 kilogram oil equivalent per dollar as compared to 0.21 of the world average. But there is a still room for improvement and can be brought down further significantly with current commercially available technologies. India has already taken significant steps like enactment of Energy Conservation Act and setting up of Bureau of Energy Efficiency. PLF of thermal power plant has improved significantly over the years. 'Partnership in Excellence' is latest initiative for bringing up the PLF of most poorly performing stations. There is a renewed thrust for reduction of transmission and distribution losses. Some success is already visible.

While talking about the deployment of new technologies for reduction of greenhouse gas emissions, I would like to appreciate the efforts of world community in terms of the U.N. Framework Convention Treaty on Climate Change and the Kyoto Protocol. This mechanism recognizes the 'common but differentiated responsibilities' of the countries in the matter of reduction of greenhouse emissions. The Convention also recognizes that as developing countries grow, their emissions are bound to increase. The energy consumption in India is only 0.52 tonnes of oil equivalent per capita as compared to world average of 1.69.

Given the fluctuation and volatility in oil prices and concentration of most of the world oil and gas resources in few countries, coal is emerging as one major source of energy worldwide from the angle of energy security. The abundance of coal, its location in large parts of the world makes it a reliable source of energy, both in developed and developing countries. Coal transportation and storage systems are modem and clean. It has been possible to increase the efficiency of coal based electricity generation by using improved technologies. Supercritical power generation technology has been adopted worldwide as it has proved to be more cost effective and efficient.

In this backdrop, it is desirable that the world community continues its efforts to develop more efficient, cost effective and cleaner technologies for coal-based power generation. Coal gasification is one such option which though costlier at present, holds

potential of becoming a cost effective technology in the near future. Carbon capture and storage, i.e. carbon sequestration, is emerging as one of the next futuristic options.

Even though we have not undertaken any commitment to reduce greenhouse gas emissions, India has joined Carbon Sequestration Leadership Forum to become a partner in collaborative research & development efforts aimed at technological development of CCS technologies since these could be relevant in future for India, being a country which would be using coal for electricity production. I am happy to know that primacy of coal for energy production is being recognized by more and more countries. Greece has joined CSLF as its twenty-second member.

The carbon sequestration is essentially capture of carbon dioxide (CO_2) from thermal power plant and disposing of it in such a manner that it never re-enters the earth's atmosphere. The currently available processes suffer from several technological limitations like high level of energy consumption, corrosion, solvent degradation, etc. It may reduce overall power output from a thermal power plant by 30-35%. Any major break through in capture technologies, which is two-third of total sequestration cost, can dramatically change the economy of carbon sequestration.

Safe and irreversible storage of carbon dioxide will be a great concern particularly for country like India due its complex topology, extensive mineral excavation activity and dense population. Leakage of carbon dioxide in atmosphere and ground water may jeopardize local ecology and can have great impact on local population. Acceptability of underground carbon dioxide storage by local people will be a major issue.

Technology required for CO_2 storage in geological formations like oil/gas reservoirs, deep saline aquifers, etc. is almost developed and mostly adopted from reservoir exploration in petroleum industries. Considering present petroleum price, enhanced oil recovery has good economic potential but has limited capacity. Serious concern has been expressed about the impact of CO_2 on marine life in case of deep oceanic storage. These technological challenges, I am sure, are going to be addressed to by CSLF.

With present technological status, implementation of carbon sequestration will double the power generation cost. Therefore, the challenge before the scientific community is not only to mature the soundness of technologies but also to bring down the cost significantly. Only, thereafter it would be feasible to consider deployment of such technologies.

I wish every success for this meeting.