Role of Nuclear Power in India's Initiatives Towards Net Zero

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India Energy Forum organized a Nuclear Power Conclave on 2nd March 2023. The objective was to discuss about the efforts and steps that are needed for accelerating the pace of nuclear power capacity, particularly in the wake of large-scale expansion of Solar power and Wind Power, and the rapid path India has chosen to follow to achieve Net Zero. The recent global developments and highly complex geo political situation have further enhanced the challenge for developing countries to not only address energy access with due regard to environmental sustainability but also cope with an added dimension of energy security meaning energy independence).

India has targeted to achieve 500,000 MW (500 GW) of renewables by the year 2030. Solar and Wind Power Program of this nature can succeed only if appropriate arrangements are made to provide the back up during evening hours when solar plants would not be able to supply power. Part of this challenge can be mitigate by having larger expansion of wind power and hybrid arrangement of wind and solar. It has been seen that wind power plants, during evening and night give better output than during daytime. However, several other options will be needed to address the mammoth challenge of such massive expense of solar power and the technical challenges that it brings about in the management of grid. One of these options, which is being pursued seriously, is the program of Pump Storage Hydro Plants (PSP), for which the Power Ministry has recently announced a draft guideline soliciting comments and observations. Battery storage is being explored on a global level, but it appears that to bring this option into effective and affordable viability might take time. Hence, India will need to work on several options simultaneously.

Nuclear power is a carbon free power generation process. It can be viewed, on a larger scale, to be operating, on base load basis, and remain available in evening and night when power from solar system is not available. India should be proud of its nuclear scientist and engineers who have demonstrated a very high level of performance in various nuclear power plants which today aggregate to a total capacity of about 7,000 MW (7 GW). The country is one of the 35 nuclear power nations, and is among top 12. There was a time, prior to the famous international Nuclear Fuel Supply Agreement, when due to inadequacy of fuel supply, the utilization of capacity in terms of Plant Load Factor used to be between 50 percent to 60 percent. Post this Agreement, the situation has improved substantially. Now most of the plants are operating at an average of around 80 percent and some of them at 90 percent PLF.

Progress on the capacity addition has however, remained very slow. India started its journey toward design and building Nuclear Power Plant in mid 60s. The Atomic

Energy Act of provided for during the period of last six decades, we have been able to develop only about 7000 MWs. There are various reasons for this slow growth, which we need not to discuss and focus on how we do go now. So that the pace of capacity addition is accelerate. At present about 9600 MWs of plants are being developed and should be completed in 5 years or so. A number of plants are at the stage of drawing boards and will require approvals of different nature and financing to take off one construction. But the task ahead is much larger. In next 10 years or so India's total power generation capacity might reach 800 GW. Nuclear Capacity today is about 7000 MW compared to 410 GW of total capacity, which is just 1.7 percent, though in terms of power generation it is about 3.4 percent. Can we hope that in the next 10 years, when India reaches an overall capacity of 800 GW, Nuclear capacity grows from 1.7 percent as at present to about 4 percent? It is indeed a challenging target, but it is doable.

It would be relevant to examine as to why the progress in last several decades has been slow, with a view to evolving a course of action which will lead to accelerating the pace of capacity addition. One of the reasons has been that when we entered the new century, even the existing capacity, which was of the order of 4500 MW then, did not have adequate nuclear fuel. Another reason could be that our domestic manufacturing base was not sufficient to provide the support that was needed for a larger growth rate. In the middle of 1980s, the government did decide to set up a Company - Nuclear Power Corporation (NPC) so that the nuclear power plants could be developed through a corporate entity. This did work out and NPC has proved to be a successful organisation. Though the Atomic Energy Act did provide for other government companies to also undertake development of nuclear power plant, but for variety of reasons we continued to depend solely on the nuclear power corporation. After Electricity Act 2003 was enacted, during 2004 - 2005, discussions were held for amending the Act to provide for also private sector participation to develop nuclear power plants, besides also facilitating capacity addition through other Government companies. However, the challenge then was to arrange nuclear fuel even for the existing capacity and hence intensive diplomatic efforts were mounted to see that India gets access to nuclear fuel globally through signing nuclear supply agreement. The priority thus shifted from amending the Act to this agreement. In the process of these discussions, it was found that the existing restrictions and safeguards needed to be properly reassessed before opening up of the Sector.

Now that the issue of accessing nuclear fuel has been addressed, it is time that the Department of Atomic Energy revisits some of these issues and formulates concrete Action Plan aimed at accelerated growth of Nuclear Power. While giving reply to a Parliament Question recently (after the IEF Conclave), the Union Minister Mr Jitender Singh mentioned in the Lok Sabha " the present Nuclear Power capacity is set to increase from 6,780 MW to 22,480 MW by 2031 on progressive completion of projects under construction and accorded sanction. In next three years capacity addition of 5,300 MW is planned." This indeed is reflective of a renewed thrust to nuclear power.

To further accelerate the capacity addition programme, the outline could form the framework of such an approach:

1) Nuclear Power Corporation should draw a more aggressive capacity addition plan - medium and long term - to see that in next ten years the capacity crosses 30 GW thus raising the proportion to about 4 percent of total installed capacity.

2) NPC is a profit making Company. It has and will continue to add internal financial resources. Besides, it can access capital marker to further enhance its equity base. It need not depend on government budgetary support even for a faster growth.

3) It has already been decided that NTPC and NPC could form Joint Venture to develop power projects to supplement the efforts nuclear power corporation. Power Ministry and Department of Atomic Energy may create a Steering Group to see that this initiative moves forward. NPC could form JV Companies with other government companies as well.

4) Next step could be to enable NTPC and a few other Public Sector Companies to develop nuclear power plants on their own without having to go through JV route with NPC. The apprehensions about the ability of other companies developing these plants are misplaced since they could access appropriate expertise by hiring the required experts to implement these projects.

5) The Government could consider amending the Act to enable private sector also to develop nuclear power plants. After gaining experience through other options mentioned earlier, the government could allow private sector also to develop nuclear power plants.

6) As the Sector opens up progressively, the Regulatory Safeguards will need to be reviewed to further strengthen the process as well as Regulatory set up. Even though the existing organisation is fully competent, such strengthening will enhance the confidence of people at large.

7) There is general acceptance in India to have Nuclear Power in the Energy Basket. India has demonstrated an excellent track record. From time to time, however, narratives keep changing and negative perceptions crop up. It would be desirable to have focused awareness programmes to keep the support base for Nuclear Energy intact and also to change the perceptions of others.

8) Top priority should be given to ensure that the on-going projects (under construction) aggregating to 9,600 MW are commissioned in time. Similarly the other projects at planning stage, aggregating to about 30 GW should be brought into active project management mode.

9) While Fuel availability does not appear to be a challenge now, it will be desirable that, when the capacity addition programme gets a quantum jump, the availability of required amount of Fuel over a long period is properly reassessed.

10) There are a number of large public and private sector companies - many of them were set up during last fifteen years - to manufacture plants and machinery

mainly for thermal power plants. They could reorient and equip themselves for manufacturing of equipments for Nuclear Power Plants.

11) The Initiative on Fast Breeder Reactor Technology, started in 2003, holds tremendous potential for a rapid expansion addressing largely the challenge of fuel security. This obviously deserves all supports to complete this project.

India's ambitious programme of transforming its energy profile, from a highly fossil fuel centric character to predominance of renewables, aimed ultimately at Net Zero by the year 2070, requires several other initiatives for a successful energy transition. It has unfolded a good space and opportunity for nuclear power to grow and support this challenging transition. The Task is huge and the time frame too demanding. An attempt has been made in this article to provide a brief framework of actionable and doable agenda.

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