National Policy for Science and Technology

The thrust of the Scientific Policy Resolution, 1958 was on capacity-building in advancement of science as the foundation for making a strong nation, which had just freed itself from the shackles of colonial domination . The focus of the Technology Policy Statement, 1983 was attainment of technological self-reliance and building of national strength by reducing vulnerability in strategic areas .

The Science and Technology Policy, 2003 launched a massive programme for attracting our best talents to the arena of research in basic sciences, so that India continues to earn respect in a competitive knowledge society.

The Science, Technology and Innovation Policy (STIP), 2013 has put our science, technology an innovation (STI) system as the driver for faster, sustainable and inclusive growth .

The latest policy envisages creation of a new STI ecosystem, which finds solutions to societal problems and facilitates the entire innovation chain from knowledge to wealth creation, while at the same time attracting best students to this area, ensuring a premier position for India in the scientific world.

Investments in Science and Technology

- Global investments in science, technology and innovation are estimated at $1.2 trillion as of 2009. India's R&D investment is less than 2.5% of this and is currently under 1 % of the GDP.
- Increasing Gross Expenditure in Research and Development (GERD) to 2% of the GDP has been a national goal for some time.
- Achieving this in the next five years is realizable if the private sector raises its R&D investment to at least match the public sector R&D investment from the current ratio of around 1 :3. The new paradigm is "Science technology and innovation for the people".



Position in Research Publications

- The gross budgetary support for the science and technology sector has significantly increased during the last decade. The impact of such increase is becoming evident.
- India ranks ninth globally in the number of scientific publications and 12th in the number of patents filed. The Composite Annual Growth Rate (CAGR) of Indian publications is around 12±1% and India's global share has increased from 1.8% in 2001 to 3.5% in 2011.
- But the percentage of Indian publications in the top 1 % impact making journals is only 2.5%.

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- By 2020, the global share of publications must double and the number of papers in the top 1 % journals must quadruple from the current levels.

Key Elements:

- Promoting the spread of scientific temper amongst all sections of society.
- Enhancing skill for applications of science among the young from all social strata.
- Making careers in science, research and innovation attractive enough for talented and bright minds.
- Establishing world class infrastructure for R&D for gaining global leadership in some select frontier areas of science.
- Positioning India among the top five global scientific powers by 2020.
- Linking contributions of science, research and innovation system with the inclusive economic growth agenda and combining priorities of excellence and relevance.
- Creating an environment for enhanced Private Sector Participation in R&D.
- Enabling conversion of R&D outputs into societal and commercial applications by replicating hitherto successful models as well as establishing of new PPP structures.
- Seeding S&T-based high-risk innovations through new mechanisms.
- Fostering resource-optimized, cost-effective innovations across size and technology domains.
- Triggering changes in the mindset and value systems to recognize, respect and reward performances which create wealth from S& T derived knowledge.
- Creating a robust national innovation system

Focus of the Policy

- Facilitating private sector investment in R&D centres in India and overseas.
- Promoting establishment of large R&D facilities in PPP mode with provisions for benefits sharing.
- Permitting multi stakeholders participation in the Indian R&D system.
- Treating R&D in the private sector at par with public institutions for availing public funds. Bench marking of R&D funding mechanisms and patterns globally.
- Modifying IPR policy to provide for marching rights for social good when supported by public funds and for co-sharing IPRs generated under PPP.
- Launching newer mechanisms for nurturing Technology Business Incubators (TBls) and science-led entrepreneurship.
- Providing incentives for commercialization of innovations with focus on green manufacturing Important Observations Policy places greater thrust on innovation, establishing research institutes and encourage women scientists with an aim to position itself among the top five scientific powers in the world by 2020.
- It talks about modifying the intellectual property regime to provide for marching rights for social good when supported by public funds and co-sharing of patents generated in the public private partnership mode.
- Aims at producing and nurturing talent in science, to stimulate research in universities, to develop young leaders in the field of science and to reward performance.

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- Seeks to create a policy environment for greater private sector participation in research and innovation and to forge international alliances and collaborations to meet the national agenda.
- Talks of raising gross expenditure in R&D to two per cent of GDP from the current one per cent in this decade by encouraging enhanced private sector contribution.
- Seeks to trigger an ecosystem for innovative abilities to flourish by leveraging partnerships among diverse stakeholders and by encouraging and facilitating enterprises to invest in innovations.

Criticism:

The policy hardly describes any structural or procedural changes which will achieve the grand goal of integrating science, technology and innovation to create value in an inclusive manner.

Energy demand of the country

The primary energy consumption in India is the third biggest after China and USA with 5.5% global share in 2016.The electricity generation target of conventional sources for the year 2017-18 has been fixed as 1229.400 Billion Unit (BU). i.e. growth of around 5.97% over actual conventional generation of 1160.141 BU for the previous year (2016-17). The conventional generation during 2016-17 was 1160.141 BU as compared to 1107.822 BU generated during 2015-16, representing a growth of about 4.72 %.

India has become power surplus from chronic power shortage. Record capacity additionof around one-fifth of current conventional power capacity and solar power capacity addition of 157% in the last two years led to a boost in power generation. The highest-ever increase in transmission lines and sub-stations improved the transmission scenario resulting in energy deficit falling to lowest ever of 2.1% in 2015-16.

Energy Crisis can be described as a situation in which a country suffers from frequent disruptions in energy supplies because of large and increasing gaps between availability and demand of electricity accompanied by rapidly increasing energy prices that threaten economic and social development of the nation.

- Our over-dependence on limited and exhaustible sources of energy such as our coal and oil deposits.
- Increasing gap in the demand and supply of the energy.
- Ever increasing prices of the energy and fuel from other countries.
- Reluctance in using alternative and renewable sources of energy, such as solar,wind, bio-energy, etc..
- Overuse and misuse of the available sources of energy.

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Conventional and Non-conventional sources of energy

Conventional and Non Conventional Sources of Energy

Main Sources of Energy:

The sources of energy are of following types:

1. **Conventional Sources of Energy:**

These sources of energy are also called non renewable sources. These sources of energy are in limited quantity except hydro-electric power.

(a) Coal and Lignite:

Coal is the major source of energy. Coal deposits in India are 148790 million tonnes. Total lignite reserves found at Neyveli are 3300 million tonnes. In 1950-51, annual production of coal was 32 million tonnes. In 2005-06, annual production of coal was 343 million tonnes.

Lignite production was 20.44 million tonnes in 2005-06. According to an estimate, coal reserves in India would last about 130 years. India is now the fourth largest coal producing country in the world. Coal deposits are mainly found in Orissa, Bihar, Bengal and Madhya Pradesh. It provides employment to 7 lakh workers.

(b) Oil and Natural Gas:

In India it is found in upper Assam, Mumbai High and in Gujarat. The resources of oil are small in India.

In 1950-51, the total production of oil in India was 0.3 million tonnes. It increased to 32.4 million tonnes in 2000-01. Despite tremendous increase in oil production.India still imports 70% of has oil requirements from abroad. In 1951, there was only one oil refinery in Assam.

After independence 13 such refineries were set up in public sector and their refining capacity was 604 lakh tonnes. After implementation of economic reforms, private refineries are also engaged in oil refining. As per current rate of consumption, oil reserves in India may last about 20 to 25 years.

Electricity

There are three main sources of power generation:

1. Thermal Power
2. Hydro-electric power
3. Nuclear Power
4. **Thermal Power:**

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It is generated in India at various power stations with the help of coal and oil. It has been a major source of electric power. In 2004-05, its share in total installed capacity was 70 percent.

2. **Hydro electric Power:**

It is produced by constructing dams over overflowing rivers. For example BhakraNangal Project, Damodor Valley Project and Hirakund Project etc. In 1950-51, installed capacity of hydro-electricity was 587.4 MW and in 2004-05, it was 19600 MW.

3. **Nuclear Power:**

India has also developed nuclear power. Nuclear Power plants use uranium as fuel. This fuel is cheaper than coal. India has nuclear power plants at Tarapur, Kota (Rajasthan) Kalapakam (Chennai) Naroura (UP). Its supply accounts for only 3 percent of the total installed capacity.

POWER FROM NON CONVENTIONAL ENERGY

India is one of the fastest growing countries in terms of energy consumption. Currently, it is the fifth largest consumer of energy in the world, and will be the third largest by 2030. At the same time; the country is heavily dependent on fossil sources of energy for most of its demand. This has necessitated the country to start aggressively pursuing alternative energy sources - solar, wind, biofuels, small hydro and more.

1. **Wind Energy**

India‘s wind power potential has been assessed at 48500 MW. The current technical potential is estimated at about 13 000 MW, assuming 20% grid penetration, which would increase with the augmentation of grid capacity in potential states. The state-wise gross and technical potentials are given below India is implementing the world's largest wind resource assessment program comprising wind monitoring, wind mapping and complex terrain projects.

1. **Hydro Energy**

Hydro power is the largest renewable energy resource being used for the generation of electricity. The 50,000 MW hydro initiatives have been already launched and are being vigorously pursued with DPRs for projects of 33,000 MW capacity already under preparation. Harnessing hydro potential speedily will also facilitate economic development of States, particularly North-Eastern States, Sikkim, Uttaranchal, Himachal Pradesh and J&K, since a large proportion of our hydro power potential islocated in these States. In India, hydro power projects with a station capacity of up to 25 megawatt (MW) each fall under the category of small hydro power (SHP).

1. **Solar Energy**

India is a solar rich country. India is a country near the equator – which means that given its geographical location, it is subject to a large amount of solar radiation throughout the year. India is also, according to area, the 7th largest country in the world.

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