International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

India's Energy Security Scenario: Challenges and Opportunities

Anshu Yadav

Department of Defence and Strategic Studies, Deen Dayal Upadhyaya Gorakhpur University, Gorakhpur

Abstract:
Energy security of India is critical for national security, sustainable development and economic growth. Energy security is an important component of India's national security and renewable energy sources offer significant potential to enhance energy security in India, energy reliance is aimed to get promoted through various policies and initiatives such as Wind Energy Program, National Solar Mission and Bio Energy Mission. Enhancing energy security of India includes enhancing energy security through the development of advanced energy storage technologies, improving the efficiency of renewable energy systems. The objective of this paper is to highlight the growing importance of energy in India's national security and to explore the possibilities of enhancing energy security of India through self reliance with the help of research and innovation. The presented paper begins by discussing the India's energy spectrum which highlights energy security scenario, strategies rated to energy security and also the regional and global cooperation in energy sector by India. It also present initiatives taken by government and analyse the renewable energy sources. The paper emphasizes various challenges to energy security in various dimensions. At the end, this paper underlines the major opportunities for India in energy security in futuristic scenario.

Keywords: Energy Spectrum, Energy Security Scenario, Energy Strategies, Energy Cooperation, Renewable Energy.

Introduction:

National security is critical to India's survival and development as a nation, and its policies and capabilities have implications for regional and global security. National security of India refers to the methods taken by the Government of India to protect the country's sovereignty, territorial integrity and citizens from internal and external threats. The term "national security" includes a broad range of areas, including military defence, law enforcement, border security, intelligence gathering and analysis, and cyber security. National security is vital for the survival and development of a nation. India is the home to diverse cultures, religions and castes whose consumption of energy patterns are also diverse. The country is strategically located in a volatile region, sharing borders with several countries including Nepal, Bhutan, Bangladesh, Pakistan, China and Myanmar.

Energy security is an important element of national security. It refers to the uninterrupted availability and access of affordable and reliable energy sources essential for the economic, social and political stability of a country. Energy security of India is a complex issue closely linked to its national security. Energy security and national security are directly linked as energy is a vital component of modern economies and societies. Energy is needed to power everything from transportation and industry to

homes and technology. Countries that are able to ensure a stable and reliable supply of energy are better able to support their economies, meet the needs of their citizens, and maintain their geopolitical influence. India has faced several security challenges since independence, including terrorism, insurgency, border disputes and regional conflicts. National security measures become necessary to protect the country's political stability, economic development and social welfare.

India is reliant on imports for its energy needs, most part of its oil and gas requirements being met through imports. This dependence on foreign sources of energy makes India vulnerable to supply disruptions and price volatility in the global energy market, which can have serious implications for the country's economy and national security. The importance of energy security in national security can be emphasized from the following points: can be understood through

Overview of India's Energy Spectrum: Energy Security Scenario, Strategies,

Sources and Cooperation: India's energy demand has been growing rapidly over the past few decades, driven by economic growth, population growth and urbanisation. According to the IEA report, India's energy demand is projected to grow three per cent annually due to urbanisation and industrialisation[1], making it the fastest growing major energy consumer in the world. As China and the United States are at top respectively, India is the third-largest consumer in the world in energy sector . Oil, coal, hydroelectric electricity, natural gas, nuclear power, and renewable sources including wind, solar, and biomass are all included in the nation's energy mix. In order to fulfil the nation's rising energy needs and lessen its dependency on fossil fuels, the Indian government has implemented a number of actions. These actions include improving energy efficiency, expanding the use of renewable energy sources, and investing in innovative technologies like energy storage and electric vehicles. India is also the world's second-largest producer of coal, behind China. The following crucial fuels are oil and natural gas.

Energy Scenario of India: India's energy landscape is diverse, with a mix of conventional and renewable energy sources. Coal is the foremost fuel in India's total energy volume, estimating for about 55% of the country's total energy consumption.[2] India has been increasing its renewable energy capacity in recent years with the goal of achieving renewable energy capacity, with a commitment to install 500 GW of renewable energy capacity by 2030 and to become a net zero emitter of greenhouse gases by 2070.[3] In order to fulfil the goal of satisfying the energy needs, a significant role will be played by India's renewable energy sector. By 2040, it's anticipated that roughly half of the world's electricity would be generated from renewable sources. With ambitious goals to grow its renewable energy capacity in the upcoming years, India has one of the greatest renewable energy expansion plans in the world. India will see the largest increase in energy demand by 25% over the next two decades and will overtake the European Union and by 2030, it becomes the world's third largest among the energy consumers. However, India still faces major challenges in getting its energy needs in a sustainable manner, including energy access, energy security and also environmental security challenges. The government and the private sector are working towards addressing these challenges through various initiatives, policies and investments in the energy sector.

Energy Security Strategies

India is one of the top emerging economies in the world, and in the upcoming years, its energy demand is anticipated to increase significantly. India's dependence on imported fossil fuels, which are not only

expensive but also increase greenhouse gas emissions that have a negative impact on the environment, makes energy security a top priority.

Countries can use a number of strategies to improve their energy security. The first step in improving energy security through energy source diversification is to lessen reliance on a single source or supplier of energy. This can be done by promoting the use of alternative fuels like natural gas and other alternatives to conventional fossil fuels, as well as by encouraging the use of renewable energy sources like wind, solar, and geothermal energy. Energy security is the second goal of energy storage. During times of low demand, excess energy produced by renewable energy sources is stored, and then it is released during periods of high demand. Even during times of peak demand, energy storage can aid in ensuring a consistent and reliable supply of energy. India imports 83% of its crude oil needs from other countries[4], so India has built up crude oil reserves to deal with any emergency. Oil is reserved. It is expected that this can reduce the prices of petrol and diesel in the country. Many more countries can take such a decision in the coming days. India has 38 million barrels of crude oil as an emergency reserve[5] in underground caves built at three places on the eastern and western seaboards. These stores are located at Visakhapatnam in Andhra Pradesh, Mangaluru and Padur in Karnataka[6]. Third, Infrastructure development such as pipelines, transmission lines and storage facilities can also enhance energy security. This can help improve the reliability and resilience of the energy supply chain and reduce the risk of supply disruptions. Fourth, International cooperation can also play a role in enhancing energy security. This could include collaborating with other countries to develop and implement energy policies, share best practices and technology, and diversify energy supply sources. Improving energy security requires a multifaceted approach that includes diversifying energy sources, improving energy efficiency, developing energy storage and infrastructure, and promoting international cooperation. By implementing these strategies, countries can increase their energy security and ensure a reliable and sustainable energy supply for their citizens.

Initiatives taken by Government of India to ensure energy security: The Government of India has taken several initiatives to ensure energy security, which includes ensuring reliable and continuous supply of energy to meet the growing demands of the country's economy and population. Some of these initiatives include:

National Solar Mission: It has been launched in 2010, aimed to achieve 100 GW of solar power by 2022[7] which has already been achieved. The government is providing financial incentives and policies to promote the adoption of solar energy, including setting up of rooftop solar projects; solar power plants solar parks etc.

Ujjwala Yojana: The scheme was launched in 2016 and aims to grant free LPG connections to women who have been marked as in BPL category[8]. The scheme has been successful in reducing the use of traditional fuels like wood and kerosene, which are harmful to health and environment.

National Bio fuel Policy: The policy aims to promote the use of bio fuels in the transportation sector, reduce India's dependence on imported crude oil, and promote rural development by generating employment in the agriculture sector.

National Electric Mobility Mission Plan: The plan aims to promote the taking up of Electric Vehicles (EVs) in the country. The government is providing financial incentives to purchase EVs, set up charging infrastructure and promote research and development in EV technology.

Atal Jyoti Yojana: The scheme has been launched in 2018 and aims to provide solar-powered lighting to homes in remote and inaccessible areas of the country that do not have access to the national grid.

These initiatives demonstrate the commitment of the Government of India to ensure energy security by promoting the use of renewable energy and alternative fuels. It also played a crucial role in self reliance in energy sector.

Analyzing the Potential of Renewable Energy in Energy Security of India

Government has taken several initiatives in various fields. India has immense potential for solar energy; the country receives an average of 300 days of sunshine per year. To advance the expansion of solar energy in the nation, the government has launched a number of initiatives, including the construction of solar parks, rooftop solar projects, and financial incentives for solar installations. The Government of India had set a target of achieving 175 GW of renewable energy capacity by 2022, of which 100 GW was from solar, 60 GW from wind, 10 GW from biomass, and 5 GW from small hydro[9], of which the most of the target has been achieved. Wind energy is another renewable energy source with great potential in India, especially in coastal areas and hilly areas. Government has implemented several policies like National Wind Energy Mission, feed-in tariff and incentives for wind energy projects to encourage the development of wind energy in the country. India has already achieved a wind capacity of over 38 GW[10]. On other side, Biomass energy is another renewable energy source that has great potential in India, as the country has a large agricultural sector that generates significant amounts of biomass waste. The government has implemented several policies such as the National Bio-Energy Mission, incentives for biomass power projects and promotion of biomass gasification to encourage the development of biomass energy in the country. Another component, Hydropower is also an important renewable energy source in India, a country with a large number of rivers and streams. The government has implemented several policies such as the National Hydropower Policy, incentives for small hydropower projects and promotion of pumped storage hydropower to encourage the development of hydropower in the country.

Energy Cooperation and Regional Security: Effective energy cooperation requires a careful balancing of benefits and risks, as well as transparency, mutual benefit, and a commitment to sovereignty and territorial integrity. Done right, cooperation in the energy sector can be very helpful in strengthening regional security and stability. By encouraging economic integration and improving relations between nations, it can significantly contribute to the promotion of regional security. In many cases, energy resources such as oil, natural gas and electricity are shared between neighbouring countries, making cooperation essential for their sustainable development. When countries cooperate on energy issues, they can create shared interests that promote peaceful relations and help reduce the risk of conflicts. For example, joint investment in energy infrastructure, such as pipelines and power grids, can help create common economic benefits that encourage cooperation rather than competition or conflict. Additionally, energy cooperation can help build trust and improve communication between countries. Regular dialogue and cooperation can help build a common understanding of energy issues and build confidence in the intentions of neighbouring countries.

India needs to balance its energy cooperation with neighbouring countries with its strategic interests and its commitment to sustainable development. Energy cooperation between India and its neighbours has become a significant part of its foreign policy in recent years. India is pursuing energy diplomacy with its neighbours to ensure a stable and secure energy supply and to promote regional integration and economic growth. Nonetheless, there are both good and bad repercussions on regional security from this cooperation. The promotion of regional integration and economic development is one of the benefits of

India's energy cooperation with its neighbours. Energy accords that India has struck with nations like Bhutan, Nepal, Bangladesh, and Myanmar have improved the region's energy security. For example, India has been importing hydroelectricity from Bhutan which has not only helped Bhutan generate revenue, but has also enabled India to meet its energy demands. Similarly, India has been investing in Nepal's energy sector, helping develop its infrastructure and improve its energy security. This collaboration has also helped in creating job opportunities and promoting economic growth in these countries.

But on the other hand, India's energy cooperation with neighbouring countries has also raised concerns about regional security. For example, India's energy cooperation with Iran has been a cause of concern for the United States, which views Iran as a major threat to regional security. The US has imposed economic sanctions on Iran, which has affected India's energy imports from Iran. Similarly, India's energy cooperation with China has raised concerns about its impact on regional security in view of the long-standing border dispute between the two countries. In addition, India's energy cooperation with neighbouring countries has also concerned about the effects of climate change. India's hydroelectric projects in Bhutan and Nepal have raised concerns about their impact on the environment and displacement of local communities.

India's participation in international energy governance has evolved significantly over the years, reflecting its growing status as a major global partner in the energy sector. India is heavily reliant on fossil fuels such as oil, coal and natural gas, which account for about 90% of its total energy need. As a result, India's energy policies and engagement in international energy governance have important implications for global security. India has actively participated in various international energy organizations including IEA, IRENA and IAEA. India's participation in these organizations is driven by its desire to harness new technologies, expand its energy sector and promote sustainable energy. India has also advanced energy security through bilateral and multilateral agreements, such as the India-US Strategic Energy Partnership, the India-Japan Energy Dialogue and the India-Africa Forum Summit. The objectives of these agreements are to enhance energy cooperation, promote investment and facilitate transfer of technology.

In addition to its participation in international energy governance, India has taken steps to promote domestic energy security by investing in renewable energy and reducing dependence on fossil fuels. India's participation in international energy governance has a significant impact on global security. For example, India's membership in the IEA has helped promote global energy security by ensuring the availability of emergency oil supplies in the event of disruption in the global oil market. India's efforts to promote renewable energy have also contributed to reducing global greenhouse gas emissions, thus addressing the global threat of climate change

Challenges and Opportunities in the Indian Energy Sector: As the nation attempts to satisfy its rising energy needs by turning to cleaner sources of energy, the Indian energy sector faces both opportunities and challenges. The high cost of renewable energy in comparison to fossil fuels, the lack of adequate infrastructure for the transmission and distribution of renewable energy, and regulatory and policy obstacles all still exist. India's energy sector is undergoing significant transformation, and the country is well positioned to become a leader in renewable energy in the coming years. Here are some of the key challenges:

- Energy independence: Countries that depend on imported fossil fuels can be vulnerable to price shocks, supply disturbances, and geopolitical tensions. By advancing in renewable energy sources

such as wind, solar, geothermal, hydroelectric and bio power, countries can reduce their dependence on foreign oil and increase their energy independence.

- Economic stability: Energy security is essential for economic stability, as it supports industries, businesses and households. A stable and reliable energy supply ensures the availability of energy at affordable prices, which can help the economy run smoothly. India's growing economy is heavily dependent on energy, especially electricity. Any disruption in the supply of electricity can have a serious impact on the economic growth and development of the country. Energy security is also important for India's agricultural sector, which is the backbone of its economy and employs a significant portion of its workforce. Any interruption in the electricity supply to the agricultural industry.
- Political stability: India is heavily dependent on energy imports, vulnerable to supply disruptions, which can lead to political unrest and instability. Ensuring energy security mitigates this risk and provides political stability.
- Defence Capabilities: A reliable and secure energy supply is essential to a country's defence capabilities. Any interruption to the energy supply could have a big impact on military operations and equipment, which depend on a constant and uninterrupted supply of energy. It may affect the nation's military mobility. Energy security is particularly important to India's strategic and military interests. The country's armed forces are one of the biggest consumers of energy, and any disruption in the supply of energy can severely affect their operations. For example, during the 1999 Kargil war with Pakistan, India faced severe fuel shortages, which limited the mobility of its troops and affected its operational capabilities.
- Environmental sustainability: Energy security of a nation is also linked to environmental sustainability. Developing a diverse and sustainable energy mix can help reduce the environmental impact of energy consumption, while also reducing dependence on foreign energy sources.
- Self Resilience: Renewable energy sources can also increase a country's resilience to natural disasters such as floods and wildfires, which can disrupt energy supplies and threaten public safety. By decentralizing energy production and distribution, renewable energy can ensure that
- Climate change: Climate change can exacerbate existing security threats, including conflict over resources such as water and food, and the displacement of populations due to rising sea levels and extreme weather events. By reducing greenhouse gas emissions and converting to renewable energy, countries can mitigate the effects of climate change and help prevent security risks.
- Economic development: Investing in renewable energy can also spur economic growth and job creation, especially in rural areas. Renewable energy projects can provide new opportunities for farmers and landowners, as well as support the development of small businesses and local economies.
- Dependence on fossil fuels: Around 90% of India's energy needs are met by fossil fuels like coal, oil, and natural gas. This reliance on fossil fuels presents a number of challenges, including air pollution, high carbon emissions and vulnerability to price fluctuations in the global energy market.
- Inadequate Energy Infrastructure: Despite major advancements in recent years, India's energy infrastructure is still unable to keep up with the nation's rising electrical consumption. Many rural areas still lack access to reliable electricity, while transmission and distribution infrastructure in urban areas is often outdated and inefficient.

- Limited investment in renewable energy: Although though India has made great strides in recent years to promote renewable energy, the nation still has a lot of work to do to attract investment in this field. This is due to a number of factors including high capital cost, regulatory uncertainties and lack of supportive policies.

Opportunities: The relationship between energy security and national security is complex and multidimensional, and requires careful consideration of economic, political and strategic factors. To address its energy security concerns, India has adopted a multi-pronged approach. The nation has diversified its energy supplies, making significant investments in clean energy sources including solar, wind, and others. Through programmes like the "Make in India" campaign, which attempts to improve domestic manufacturing capabilities, India has also concentrated on growing its domestic output of petrol and oil. Despite the difficulties, India has potential to advance renewable energy. Growing Energy Demand: India's energy demand is likely to grow considerably in the upcoming years, creating a huge market for renewable energy.

- Abundant renewable energy resources: India's energy consumption is anticipated to increase significantly in the next years, opening up a sizable market for renewable energy.
- Government Support: The Government of India has executed policies and initiatives to promote renewable energy development, such as providing subsidies and incentives to developers.
- Employment Generation: The renewable energy sector has the potential to create a large number of jobs in India, especially in rural areas where employment opportunities are limited.
- Promoting renewable energy in India faces many challenges, but also many opportunities. With the right policies, incentives and infrastructure development, India can unlock the full potential of renewable energy and contribute to a sustainable future for the country and the planet.
- Growing demand for electricity: India's growing economy and growing population are driving up the demand for electricity, creating significant investment opportunities in the energy sector. This demand is expected to increase in the coming years, making India a striking destination for energy investment.
- Increased access to technology: Advances in technology have made renewable energy more affordable and efficient, giving India an opportunity to increase its renewable energy capacity and shrink its reliance on fossil fuels.
- Countries that depend on others for their energy needs are vulnerable to supply disruptions, price increases and political pressure. This can pose significant national security risks, especially if the energy supply is critical to the functioning of key sectors such as defence or critical infrastructure.
- Therefore ensuring energy security can be seen as an important aspect of national security. Countries that are able to develop their own domestic energy resources, diversify their energy supply and reduce their overall energy consumption are able to protect themselves from external threats and maintain their sovereignty.
- Furthermore, energy security can also be viewed as a tool of foreign policy, as countries may use their energy resources to influence other countries or promote their geopolitical interests. This can create both opportunities and challenges for global stability and security.

References:

1. India likely to see biggest jump in energy demand globally, says IEA, Business Standard, 27 October 2022 https://www.google.com/amp/s/wap.business-standard.com/article-amp/economy-policy/india-likely-to-see-biggest-jump-in-energy-demand-globally-says-iea-122102700929_1.html
2. Ministry Of Coal, Government of India, Coal – Indian Energy Choice, https://coal.nic.in/en/major-statistics/coal-indian-energy-choice
3. Birol, Fatih & Kant, Amitabh, India's clean energy transition is rapidly underway, benefiting the entire world, Commentary — 10 January 2022 https://www.iea.org/commentaries/india-s-clean-energy-transition-is-rapidly-underway-benefiting-the-entire-world
4. India's Import of US Oil Jumps 10-fold to 2,50,000 bpd, The Economics Times, 25 February, 2020, https://economictimes.indiatimes.com/industry/energy/oil-gas/indias-import-of-us-oil-jumps-10-fold-to-250000-bpd/articleshow/74302108.cms?from=mdr
5. India to release 5 million barrels of crude oil from strategic reserves, The Hindu, 23 November 2021 https://www.thehindu.com/business/Economy/india-to-release-5-millon-barrels-of-crude-oil-from-strategic-reserves/article37640438.ece
6. Strategic oil storage facility to be commissioned in January, The Economics Time, 15 November 2013 https://economictimes.indiatimes.com/industry/energy/oil-gas/strategic-oil-storage-facility-to-be-commissioned-in-january/articleshow/25768640.cms?from=mdr
7. MNRE: YEAR END REVIEW-2020, Press Information Bureau, 31 December 2020 https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=1685046
8. Ministry of Petroleum and Natural Gas, Pradhan Mantri Ujjwala Yojana https://mopng.gov.in › files › lpg › revujscheme PDF
9. United Nations, Department of Economic and Social Affairs, Sustainable Development, India plans to produce 175 GW of renewable energy by 2022. https://sdgs.un.org/partnerships/india-plans-produce-175-gw-renewable-energy-2022
10. Ramping up wind power capacity will be key to realise India's decarbonisation ambitions and drive a green recovery, Global Wind Energy Council https://gwec.net/global-wind-energy-council/taskforces-committees/india/