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INTERNATIONAL INTERDEPENDENCE FOR ENERGY SECURITY IN PRESENT TIMES

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Abstract: Energy remains the backbone of the global economy in present times, and competition is most closely associated with achieving energy security. States, whether big or small, have been involved in a race to achieve energy security for national development; however, in the process, they have foregone the need and opportunity to accumulate the benefits coming from greater interdependence and cooperation between them. The paper proposes that states under prevailing circumstances, when climate change is manifesting in new forms and volatility in global oil markets is at an all-time high, need to overhaul their understanding and application of energy security according with the ground realities. Energy security at the world level can be achieved through cooperative adjustments along the supply chain, involving supply, transit and consuming states, to build enhanced mutual dependence. These adjustments would enable states to reposition themselves and optimally operate in the global energy trade; thus, altering the dynamics of global energy system and embedding sustainability in it. All of that will come with the dedication of national governments, along with a sense of urgency and participation in decision-making among end consumers (i.e. people) and advocacy of international climate-energy forums, to revamp the existing energy system to meet the changing energy needs of mankind both at present and in coming time.

In present times, the world is witnessing a whirlwind of events, both in man-made environment and natural environment. In the man-made environment, some events are continuing processes that have lately gained pace, like inter-state and multi-state conflicts (U.S.-China trade war and South China Sea dispute)[1]. Whilst, other events have occurred completely unexpected, like Uberisation – breakthrough technologies capturing global/national markets and revolutionizing the way humans have traditionally operated and a new pandemic and economic crisis sparked by human interferences in the environment (i.e. COVID-19,[2] Furthermore, there are events that existed relatively calm in the past decades, but they have now fully erupted, like environmental movements and application of

[1] Partington, R. Global Markets Recoil as Trump Threatens US-China Trade War // *Guardian*, May 1, 2020. Mode of access: https://www.theguardian.com/business/2020/may/01/global-markets-donald-trump-us-china-trade-war-coronavirus-covid-19; Bowden, E. China's Military Expels US Navy Warship from South China Sea // *New York Post.* May 1, 2020. Mode of access: https://nypost.com/2020/05/01/chinas-military-expels-us-navy-warship-from-south-china-sea/; Wong, C. Vietnam Accuses China of 'Seriously Violating' Sovereignty' // *South China Morning Post.* April 20, 2020. Mode of access: https://www.scmp.com/news/china/diplomacy/article/3080756/vietnam-accuses-beijing-seriously-violating-sovereignty-south

[2] Nicolas, G. The Uberization of Work / Medium, June 28, 2017. Mode of access: https://medium.com/@NicolasTalenteum/the-uberization-of-work-4c7666018058; Babali, B. What is Uberization? // *The Business Year*, August 6, 2019. Mode of access: https://www.thebusinessyear.com/what-is-uberization-and-how-will-5g-technology-change-work/focus; Chakraborty, I.; Maity, P. COVID-19 Outbreak: Migration, Effects on Society, Global Environment and Prevention // *Science of The Total Environment*, 2020, Iss. 728.

renewable energy for power generation.[3] These diverging trends and events cannot be placed in a specific time frame or held to have a particular start year, which is normally an essence of any research study.

This paper, on the other hands, considers the present times as the present distinctive period that encapsulates the aforementioned dynamics. In this period, all human activities, including in the areas of science and technology, finances, manufacturing, etc., are fully dependent on energy; hence, a sense of continuing insecurity gets attached to energy. There is another dimension of gauging the present realities, i.e. effects of burning fossil energy on the environment or the sustainability dimension. So much so has been the impact of burning fossil energy from the time of industrial revolution, which started in latter half of the 18th century, and has continued till at present that the naturally occurring balances in the global ecosystem have been fractured to a point of frequent climate disasters and irreversible changes in geographic landscapes.[4]

The use of fossil energy particularly escalated in the second half of 20th century, marked by relative peace and economic growths in most countries worldwide. This brought with it negative environmental impacts, and high emission of Green House Gases (GHG) and other poisonous discharges.[5] It is in the 1980s that Natural Gas, a derivative of crude oil and considered as relatively clean,[6] started to become popular due to its cheaper costs in terms of extraction and transportation. Ever since then, the consumption of natural gas has significantly grown in the global energy markets, and especially in major energy consuming countries (like US, China and India).[7]

In 1990s, the international climate forums, like 1992 United Nations Climate Change Convention, Biodiversity Convention, etc., drew considerable attention to the problem of global climate change. However, only in recent years, there has emerged a general consensus in the international community that fossils are highly polluting in nature and there is a pressing need to harness renewable energies sooner than later.[8] Despite of the growing clamour against fossil energy, its overall use has continued to rise, save in 2020 that is experiencing a global lockdown state and a global oil price crash

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3 Watts, J.; Taylor, M.; Bartlett, J. Climate Crisis: 6 Million People Join Latest Wave of Global Protests // *Guardian*, September 27, 2019. Mode of access: https://www.theguardian.com/environment/2019/sep/27/climate-crisis-6-million-people-join-latest-wave-of-worldwide-protests; International Renewable Energy Agency (IRENA). Renewable Energy Now Accounts for a Third of Global Power Capacity. Abu Dhabi United Arab Emirates: IRENA, 2019. Mode of access: https://www.irena.org/newsroom/pressreleases/2019/Apr/Renewable-Energy-Now-Accounts-for-a-Third-of-Global-Power-Capacity

4 Watts, J.; Taylor, M.; Bartlett, J. Climate Crisis: 6 Million People Join Latest Wave of Global Protests // *Guardian,* September 27, 2019. Mode of access: https://www.theguardian.com/environment/2019/sep/27/climate-crisis-6-million-people-join-latest-wave-of-worldwide-protests; Albrich, K.; Rammer, W.; Seidl, R. Climate Change Causes Critical Transitions and Irreversible Alterations of Mountain Forests / Global Change Biology, 2020.

5 Nunez, C. Carbon Dioxide Levels Are at a Record High. Here's What You Need to Know / *National Geographic*, May 13, 2019. Mode of access: https://www.nationalgeographic.com/environment/global-warming/greenhouse-gases/; Lal, R. Vulnerability of Agroecosystems to Environmental Factors // *Climate Vulnerability*, 2013, No. 4, pp. 109-116. Mode of access: https://www.sciencedirect.com/science/article/pii/B9780123847034004147

6 United States National Research Council. Committee to Review the Gas Research Institute's Research, Development and Demonstration Program, Gas Research Institute. A review of the management of the Gas Research Institute. National Academies, 1989.

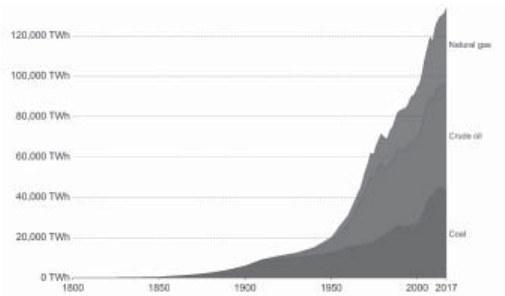
7 Global Energy Statistical Yearbook. Natural Gas Production, Grenoble, France: Enerdata, 2019. Mode of access: https://yearbook.enerdata.net/natural-gas/world-natural-gas-production-statistics.html

8 Casper, Julie K. Fossil Fuels and Pollution: The Future of Air Quality. New York, USA: Infobase Publishing, 2010; Perera, F. Pollution from Fossil-fuel Combustion Is the Leading Environmental Threat to Global Pediatric Health and Equity: Solutions Exist // *International Journal of Environmental Research and Public Health*, 2018, Iss. 15(1).

due to the prevailing pandemic.[9] That has intensified the level of global warming, thus causing higher degree of anthropogenic climate change in present times (*See Fig. 1*).

Figure 1

Global Fossil Fuel Consumption



Source: Vaclav Smil. Energy Transitions: Global and National Perspectives & BP Statistical Review of World Energy. Mode of access: OurWorldInData.org/fossil-fuels/

Renewable energy, in its multiple and variegated forms, has gained worldwide acceptance as an alternate and cleaner form vis-à-vis fossils. It offer the promise of clean energy gathered from self-renewing resources such as the sun (solar), wind (onshore and offshore), water (hydropower), earth (geothermal), and biofuels (biomass based sources). This form of energy, which by nature is decentralized, has the technical potential to replace fossil fuels.[10] However, it has a significant disadvantage to compete against Big Oil companies and large National Oil Companies (NOC). The fossil industry has state support, whether direct or indirect, and has significant resources at its disposal, including finances, technologies, expert manpower and 'lock-in' advantage (infrastructures in place and designed for exclusive fossil use).[11] Thus, renewable energy will have to overcome both technical and non-technical hurdles before it can replace fossil fuels on a global scale.

At present, it is difficult to fathom life without energy, and today, the use of fossil fuels is so deeply entrenched in our societies, both in developed and developing countries, that without energy the pillars of modern human civilization will most likely collapse.[12] While this exclusive dependence on fossil fuels is relatively slowing in recent years (*See Fig. 2*); however, the world is far away from transitioning to a complete or even majority percentage of renewable based energies. Therefore, in the present circumstances, stakeholders are competing and cooperating to meet their national energy demands from the finite hydrocarbon reserves around the world, while ensuring their environmental impacts are brought down and higher shares of renewable energy become progressively integrated in their national energy mix.

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[9] Saefong, Myra P.; Watts, W. Oil Prices Mark Lowest Finish in 2 Weeks as COVID-19 Outbreak Rattles Demand Expectations / MarketWatch, February 25, 2020. Mode of access: https://www.marketwatch.com/story/oil-edges-lower-sees-additional-selling-after-monday-drop-2020-02-25; Reuters News Agency. Power Down: China Energy Demand Falls as Virus Hits Factories // *Al Jazeera.* February 14, 2020. Mode of access: https://www.aljazeera.com/ajimpact/power-china-energy-demand-falls-virus-hits-factories-200214061808709.html

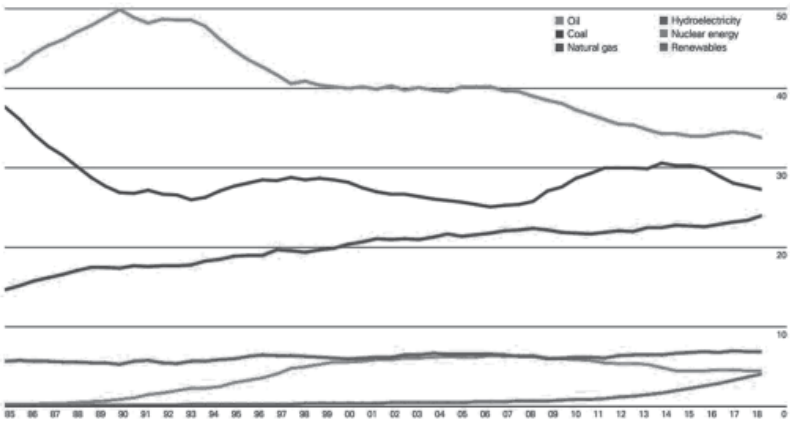
[10] Crosby, Alfred W. Answering to ProCon.org. Alternative Energy – ProCon.org, July 6, 2018. Mode of access: https://alternativeenergy.procon.org/source-biographies/alfred-w-crosby/; Stocks, M.; Blakers A. Solar PV and Wind Are on Track to Replace All Coal, Oil and Gas within Two Decades / *The Conversation*. April 6, 2018. https://theconversation.com/solar-pv-and-wind-are-on-track-to-replace-all-coal-oil-and-gas-within-two-decades-94033

[11] REN21. Renewables 2019 Global Status Report. Paris: REN21 Secretariat, 2019. Mode of access: https://www.ren21.net/wp-content/uploads/2019/05/gsr_2019_full_report_en.pdf; Stevens, P. Tech and Energy Are Teaming up, Creating a Market That Could Grow 500% in the Next 5 Years / *CNBC,* February 22, 2020. Mode of access: https://www.cnbc.com/2020/02/22/tech-and-energy-are-teaming-up-creating-a-market-that-could-grow-500percent-in-the-next-5-years.html; Burton, J.; Lott, T.; Rennkamp, B. Sustaining Carbon Lock. In: Skovgaard, Jakob and van Asselt, Harro van. The Politics of Fossil Fuel Subsidies and Their Reform: Implications for Climate Change Mitigation. Cambridgem U.K.: Cambridge University Press, 2019.

[12] Caplan, B. The Moral Case for Fossil Fuels: We Owe Civilization to Fossil Fuels. The Library of Economics and Library, 2014. Mode of access: https://www.econlib.org/archives/2014/12/the_moral_case_2.html

Figure 2

Shares of Global Primary Energy Consumption by Fuel



Source: BP Statistical Review of World Energy 2019

This paper makes a case for interdependency between actors, primarily states, to achieve energy security under prevailing circumstances, which it deems as possible through planned cooperation at the world stage. It commences with an attempt to gauge the multifarious interpretations of energy security, which includes energy sustainability within its ambit, and contextualizes that in the evolving scenario. It then discusses emerging challenges to energy security from the perspective of energy importers, exporters and transit countries. It argues that in today's globalised world, energy interdependence triumphs energy independence. Finally, it outlines various mechanisms to bolster energy security before concluding that international cooperation is essential for achieving energy security.

Energy security and its interpretations

Energy is one of the key drivers of the economy. Availability of cheap, reliable and clean energy is therefore crucial for any country to survive and develop. This applies not just to energy importing and transit countries, but also to energy exporting countries. The International Energy Agency (IEA) puts forth a simple definition for energy security as "the uninterrupted availability of energy sources at an affordable price".[13] It distinguishes between long-term energy security that is primarily concerned with timely investments to continue the supply of energy while conforming to economic developments. On the other hand, short-term energy security mainly focuses on the ability and the capacity of the energy system to promptly react to any unprecedented changes, so as to restore the supply-demand balance within the energy system. Hence, IEA's interpretation of energy security is related to physical unavailability of energy that may result in negative economic and social impacts, or energy prices that are not competitive or are overly volatile. Further, it is reflective of the interests of IEA's founding and constituting members, which mainly are the net energy importing countries in Europe (and the US, which until December 2018 had similar energy interests of importing more oil than it started exporting and further went on to become a net energy exporter in November 2019).[14]

[13] International Energy Agency (IEA). World Energy Outlook, Paris, France: IEA Publications, 2006.

[14] IEA has restricted its membership to advanced economies of the Organization for Economic Co-operation and Development (OECD), which requires them to demonstrate their net oil importer status, have reserves equivalent to 90 days' average of crude oil and/or oil products imports in the prior years, and have a demand restraint program for reducing national oil consumption by up to 10 percent. Gaffen, D. In Major Shift, U.S. Now Exports more Oil Than It Ships in. Reuters, December 6, 2018. Mode of access: https://www.reuters.com/article/us-usa-oil-eia/in-major-shift-us-now-exports-more-oil-than-it-ships-in-idUSKBN1O51X7; Cunningham,

The Energy and the Challange of Sustainability defines energy security as, "the continuous availability of energy in varied forms, in sufficient quantities, and at reasonable prices". This definition has been associated as being synonymous with energy supply security.[15] Asia Pacific Energy Research Institute, an energy unit under aegis of Asia-Pacific Economic Cooperation, has characterised energy security using the four dimensions – Availability, Accessibility, Affordability and Acceptability (APERC) – to give it a credible framework. Various authors have expanded this definition for the assessment of energy security to include other dimensions such as efficiency, governance, institutions etc.

Going beyond the four A's assessment framework, Cherp and Jewell interpret energy security as 'low vulnerability of vital energy systems.'[16] The authors define vital energy systems as those energy systems (energy resources, technologies etc.) that support critical social functions and can be segregated into geographic and sectoral boundaries, whereas vulnerability is looked upon as a combination of exposure to risks and resilience capacities.

According to Gal Luft & Anne Korin, energy security means different things to different countries based on their geographical location, their international relations, their political system and their economic disposition.[17] They contend that any country's definition of energy security depends on how it views its vulnerabilities to energy supply disruptions, which are external to the energy system. As things are in a state of constant flux, i.e. both domestic and global realties keep changing, energy security for any country is to be contextualised against a specific situation and depends on the circumstances.

Literature on energy security further reveals that energy security is a dynamic concept and can be characterised as a set of complex interrelated issues that have an inter-temporal nature. Energy security is multidimensional in nature, has a broader conceptual meaning and the interpretations are different for various stakeholders. Further, it is also acknowledged that energy security is a slippery term and it has no universally accepted definition, as it is often interpreted according to the perspective of the user.[18] In fact, energy security has often been used as an umbrella term as it covers a large set of issues.

The existing interpretations of energy security have been critiqued noting that the 'supply-side' approach to energy security, does not acknowledge the 'demand-side' aspect. Demand-side aspect of energy security can be interpreted as universal provisioning of modern energy services, which is affordable and accessible to consumers.[19] It also supports the perspective of viewing energy security as "the continuity of energy supplies relative to demand".[20]

Although the interpretation of energy security has evolved slightly over the years but, 'uninterrupted availability of energy' and 'affordability' of energy remain as the core concern for countries. The issue of environmental sustainability and lowering GHG emissions from energy use has been added to the concept in present times that broadens as well as deepens its scope.[21] In the

S. U.S. Posts First Month in 70 Years as a Net Petroleum Exporter. Bloomberg. November 29, 2019. Mode of access: https://www.bloomberg.com/news/articles/2019-11-29/u-s-posts-first-month-in-70-years-as-a-net-petroleum-exporter

15 Later, the United does mention that energy exporters are anxious about energy security of demand, but their definition of energy security largely remains the same as defined in (UNDP, UNDESA, WEC. World Energy Assessment: Energy and the Challenge of Sustainability. New York: UNDP, 2000).

16 Cherp, A.; Jewell, J. The Concept of Energy Security: Beyond the Four As // *Energy Policy*, 2014, No. 75, pp. 415-421.

17 Luft, G.; Korin, A. Energy Security Challenges for the 21st Century: A Reference Handbook. California, U.S.A: ABC-CLIO, 2009.

18 Chester, L. Conceptualising Energy Security and Making Explicit Its Polysemic Nature // *Energy Policy,* 2010, No. 38(2), pp. 887-895.

19 Reddy, S.; Nathan, H.S.K. Emerging Energy Insecurity: The Indian Dimension. Chapter. In: Dilip M. Nachane (Ed.) India Development Report (IDR). New Delhi: Oxford University Press, 2011.

20 Winzer, C. Conceptualizing Energy Security // *Energy Policy,* 2012, Iss. 46, pp. 36-48.

21 Dalby, S. Environmental Security. Minneapolis: University of Minnesota Press, 2002; Chow, E.; Elkind, J. Where East Meets West: European Gas and Ukrainian Reality // *Washington Quarterly,* 2009, vol. 32 (1), pp. 77-92.

last few years, international momentum for acting towards mitigating climate change has ensured that environmental aspects of energy now find an important place in the concept of energy security.

Considering this changing landscape and the growing importance of both energy security and energy sustainability, the concept of Sustainable Energy Security (SES) has come into vogue. It is defined as "provisioning of uninterrupted energy services in an affordable, equitable, efficient and environmentally benign manner".[22] Further, envisaging an SES index in context of developing countries, the approach "goes beyond the concept of sustainable and secure energy 'sources' and implies a sustainable and a secure energy 'system'."[23] The authors hold that the approach includes sustainability in an 'end-to-end' conception where production, conversion and distribution and supply all forms of all energy, such as electricity, in various sectors of a national economy. The paper will stretch this categorization of energy security, which includes sustainability at all levels and layers, to gauge energy dynamics at the world level.

Present challenges for energy security

Energy security is a property of the energy system[24] and it is most commonly understood in the context of a national energy system. In fact, energy security is one of the most important non-military component of national security[25] and countries include energy security as a major objective of their foreign policy. Energy security may be devolved to the level of individual states, counties, companies or even at the level of households. On the other hand, it can be up-scaled geographically from a national level to regional, continental and global level.

As the most common understanding of energy security is at the level of countries, global energy security can be rationally supposed to be a condition when all countries are energy secure. Broadly, the world can be divided into energy deficit and energy surplus countries. Energy trade is vital to achieve energy security as an energy deficit country can import various forms of energy to meet the demand of its industrial based economy. This gives rise to two categories of countries: energy importing countries and energy exporting countries and a dynamic equilibrium between energy supply and demand is essential for achieving global energy security.

As can be expected, the interests of energy importing countries and energy exporting countries are different. While energy importing countries look for 'security of supply' and affordable prices, energy exporting countries seek 'security of demand' which implies a steady demand of energy as well as reasonable prices in the future which justify the investments made in energy infrastructure. Excessive volatility in energy prices impact both energy importers and exporters and are a common cause of concern, like has been the case since late 2018.[26] Whilst, stable and predictable energy prices are in the interest of both parties.

As the economic centre of the world shifts from western industrialised countries to Asia,[27] energy trading patterns have continuously changed over the last two decade and even at present the trend continues. It is being held that the global flow of energy will now be from Middle East to new demand centres in emerging economies such as India and other developing countries in Asia, like Bangladesh

[22] Narula, K. Is Sustainable Energy Security of India Increasing or Decreasing? // *Int. J. Sustain. Energy*, 2014, Iss. 33, pp. 1054-1075.

[23] Narula, K.; Reddy, S. A SES (Sustainable Energy Security) Index for Developing Countries // *Energy*, 2016, Iss. 94, pp. 326-343.

[24] Mitchell, C.; Watson, J. New Challenges in Energy Security. In: Mitchell, C.,J. Watson, J. Whiting and J. Britton. (Eds.). New Challenges in Energy Security. Energy, Climate and the Environment Series. Palgrave Macmillan, London, 2013.

[25] Cooley, K. Energy Security: Neglected Dimension of National Security? Washington, DC: National Strategic Studies, 2011.

[26] Whipple, T.; Andrews, S. Peak Oil Review / Resilience. December 26, 2018. Mode of access: https://www.resilience.org/stories/2018-12-26/peak-oil-review-26-december-2018-2/

[27] Mahbubani, K. The New Asian Hemisphere: The Irresistible Shift of Global Power to the East. New York, U.S.A.: Public Affairs, 2008;

and Indonesia.[28] However, despite this shift, the nature of energy security concerns would be more or less unchanged.

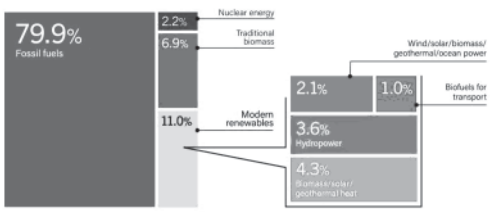
The exponential growth of renewable energy has added new energy sources on the supply side. Renewable energy primarily from solar and wind has the potential to overcome the traditional divide between energy rich and energy poor countries as renewable energy sources are spread fairly evenly.[29] Decentralised generation of electricity from renewable energy may also change the pattern of large scale electricity generation along with the way electricity is distributed within countries as well as at the global level thereby altering the quantum of flow from energy exporting to importing countries.[30]

Renewables are gradually becoming a part of the national energy mix as there is a push, both on the policy as well as on the technology front,[31] which has enabled large scale production and has made solar PV and wind cost competitive with conventional fired coal plants in some regions of the world.[32]

Notwithstanding the (media) glorified growth of renewable energy, the total share of renewable energy in global energy basket has remained low. In 2018, share of renewable in terms of total final energy consumption (TFEC) accounted for 17.9%, and within EU that was 18%,[33] which grew slightly from around 16.5% in 2008.[34] In the power sector the growth of renewable energy was more significant as the global renewable capacity totalled 2,378 GW in 2018,[35] which was just 197 GW in 2008. The figures still speak volume about the prevalence of fossil fuel in the global energy system (*See Fig. 3*).

Figure 3

Estimated Renewable Share of Total Final Energy Consumption, 2018



Source: based on IEA data

Moreover, the latest developments that have come up from outbreak of COVID-19, such as sharp restrictions on movement of people and vehicles of all kinds in all countries, negative economic growths in many countries and brakes on market innovations (including in renewable energy sector), will slowed down renewable energy transition towards cheap oil. As Fatih Birol, executive-director of the International Energy Agency, says, "The combination of coronavirus and volatile market conditions will distract the attention of policymakers,

[28] Asia House. The Middle East's Asian Pivot: Trade Growth and Opportunities. London: Asia House, 2019. Mode of access: https://asiahouse.org/wp-content/uploads/2019/03/ME-Asian-Pivot-full.pdf

[29] Elliott, D. Balancing the demands of renewable energy self-sufficiency / Physics world. October 25, 2019. Mode of access: https://physicsworld.com/a/balancing-the-demands-of-renewable-energy-self-sufficiency/; Decker, Kris D. How (Not) to Run a Modern Society on Solar and Wind Power Alone / Low Tech. September 13, 2017. Mode of access: https://www.lowtechmagazine.com/2017/09/how-to-run-modern-society-on-solar-and-wind-powe.html

[30] Yang, Z.; Liu, J.; Baskaran, S.; Imhoff, C.H.; Holladay, J.D. Enabling Renewable Energy-and the Future Grid-with Advanced Electricity Storage // *Journal of the Minerals, Metals & Materials Society,* 2010, No. 62 (9), pp. 14-23.

31 REN21. The First Decade (2004-2014): 10 Years of Renewable Energy Progress. Paris, France: Ren21 Secretariat, 2014. Mode of access: http://www.ren21.net/Portals/0/documents/activities/Topical%20Reports/REN21_10yr.pdf

[32] Dudley, D. Renewable Energy Costs Take Another Tumble, Making Fossil Fuels Look more Expensive than Ever // *Forbes*. May 29, 2019. Mode of access: https://www.forbes.com/sites/dominicdudley/2019/05/29/renewable-energy-costs-tumble/#3226bd81e8ce

[33] European Environment Agency (EEA). Share of Renewable Energy in Gross Final Energy Consumption in Europe. København, Denmark: EEA, 2019.

[34] Tracking SDG7. The Energy Progress Report 2018. New York, U.S.A.: World Health Organization, 2018.

[35] REN21. Renewables 2019 Global Status Report. Paris: REN21 Secretariat, 2019. Mode of access: https://www.ren21.net/wp-content/uploads/2019/05/gsr_2019_full_report_en.pdf

business leaders and investors away from clean energy transitions."[36]

Thus, it can be concluded that fossil fuels would continue to form a major part of the global energy mix even in the future and energy security in its traditional form would continue to drive energy policies of various countries. The use of renewables will supplement the efforts to achieve energy security as it will reduce consumption of fossil energy and may insulate national energy systems from both supply chain disruptions and commodity price fluctuations. However, there are certain limitations due to the intermittency of renewable energy which need to be overcome before a large-scale integration of renewable energy can be undertaken.

Traditional concerns for energy importing countries

The world energy system has a complex and dynamic structure. A country's energy system is governed by national administration and can be viewed as sub-parts of the world energy system. A country's energy system is an open system which is characterised by the import and export of primary energy such as coal, crude oil and natural gas as well as trading of secondary energy carriers such as petroleum products, LNG and electricity and is hence intertwined with the global energy system.

For the ease of analysis, energy security can be divided into two components, the 'physical' availability of energy and the 'price' aspect of energy. Corresponding to these components, energy importing countries aim to have 'resource security' as well as 'price security'. Energy security can be assessed separately for different energy sources and the assessment can then be integrated to provide a complete picture of the country's energy security.

There are several vulnerabilities in the global energy system and in its accompanying supply chains. A large number of threats, like climate change can exert pressure on it and can exploit these inherent vulnerabilities during the stages of production, transportation or distribution of energy.

Dwindling energy resources, its physical concentration in specific areas, and growing energy demand has led to competition over resources and exuberate energy security concerns. Further, there are various factors which can lead to the disruption of energy supply chains and therefore these can threaten energy supply security. For energy importing countries threats, like political and economic instability of several energy producing countries, disruptions from interstate conflict as well as attacks on supply infrastructure, accidents, natural disasters, terrorism, sabotage and strikes in energy industry leading to a breakdown in energy supply chains.[37]

Energy importing countries are also threatened by the power of energy exporters to manipulate prices by forming cartels, e.g. the hard control exercised by Organization of the Petroleum Exporting Countries (OPEC) on oil production by virtue of it owning more than 80 percent of world crude oil reserves and having spare production capacity.[38] The ability of certain countries to cut energy supplies, e.g. the oil embargo imposed by Arab members of OPEC against the US and many European countries in 1973 that triggered the first oil shock[39] and Ukraine committing transit defaults on natural gas supplies from Russia for

[36] European Environment Agency (EEA). Share of Renewable Energy in Gross Final Energy Consumption in Europe. København, Denmark: EEA, 2019.

[37] Toke, D.; Vezirgiannidou, S.E. The Relationship Between Climate Change and Energy Security: Key Issues and Conclusions // *Environmental Politics*, 2013, Iss. 22 (4), pp. 537-552; Pronińska, K. Energy and Security: Regional and Global Dimensions / SIPRI Yearbook: Armaments, Disarmament and International Security, 2017, pp. 215-240.

[38] Salem, El-Badri. OPEC's Capacity & Commitment to Meeting World Oil Demand in the Medium-term. London: U.K. Chatham House, 2009. Mode of access: https://www.opec.org/opec_web/en/press_room/812.htm

[39] United States Office of the Historian. Oil Embargo, 1973-1974. Washington, D.C., U.S.A.; Office of the Historian. Mode of access: https://history.state.gov/milestones/1969-1976/oil-embargo#:~:text=NOTE%20TO%20READERS-,Oil%20Embargo%2C%201973%E2%80%931974,the%20post%2Dwar%20peace%20negotiations

European clients in 2009[40] and, are two relevant examples which highlight the vulnerability of energy importing countries. Hence energy importers are concerned that energy supplying countries may exploit this energy dependency as a tool to increase their political influence or for price bargaining.

In order to enhance energy security, energy importing countries resort to ownership of resources (e.g. oil assets abroad), often exercise political influence on energy exporting countries, and may use the option of military control of energy resources.[41] Further, in order to protect energy supply chains from disruptions and from the impact of geopolitical upheavals, oil importing countries attempt to decrease their reliance on foreign countries for energy resources. Economic, geopolitical and military power of a country are other factors which contribute to energy security of a country.

There are other concerns on energy security during the transportation of energy. Presence of chokepoints at sea is a major source of risk and oil tankers are likely targets for terrorists, piracy and attacks by non-state actors at sea.[42] Ensuring maritime security is therefore important along with the ability of energy importing as well as exporting countries to transport resources by sea. Ownership of fleets and control of sea routes are some of the measures which countries use to overcome the risk of disruption of energy supplies during energy transportation.[43] Pipeline infrastructure, both transnational and inside a country is also susceptible to sabotage or targeted attack.

During the distribution stage, energy infrastructure is especially prone to physical breakdown due to ageing, overloading etc. Cyber-attacks on electricity grid networks, electricity plants, offshore oil platforms and other installations are also an increasing cause of concern in recent times.[44]

Growing concerns for energy exporting countries

Energy exporting countries enjoyed a good run over the last half a century with a largely increasing trend in prices. However, over the past couple of years there has been a general reversal of energy commodity prices leading to increasing concerns for energy exporters. The trend of falling energy prices started to accelerate by the end of 2018 when US shale

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[40] In 2009, Gazprom officially claimed that Ukraine was stealing Russian supplied gas for clients in Europe, which prompted Russia to temporarily stop gas supplies to prevent Ukraine from further perpetuating the act. In 2015, Ukraine's state energy firm Naftogaz made a unilateral declaration of prohibiting gas purchases from Russia after a deal on gas pricing could not be reached in EU-brokered talks between them. This in the process affected downstream countries in EU that bought Russian gas supplies transiting through Ukraine. Gazprom. Za proshlye sutki evropeiskie potrebiteli / Gazprom website, 4 January 2009; BBC. Russia Halts Gas Supplies to Ukraine after Talks Breakdown. July 1, 2015. Mode of access: https://www.bbc.com/news/world-europe-33341322

[41] Ross, M. How the 1973 Oil Embargo Saved the Planet // *Foreign Affairs,* October 15, 2013. Mode of access: https://www.foreignaffairs.com/articles/north-america/2013-10-15/how-1973-oil-embargo-saved-planet; Li, Z.; Gallagher, K.; Mauzerall, D.L. China's Global Power: Estimating Chinese Foreign Direct Investment in the Electric Power Sector // *Energy Policy*, 2020, Iss. 136. Mode of access: https://scholar.princeton.edu/sites/default/files/mauzerall/files/chinas_global_power_energypolicy_2019.pdf

[42] Guzansky, Y.; Lindenstrauss, G.; Schachter, J. Power, Pirates, and Petroleum: Maritime Choke Points in the Middle East // *Strategic Assessment*, 2011, No. 14(2), pp. 85-98. Mode of access: https://www.offiziere.ch/wp-content/uploads/file1311767315.pdf; Whittington, M. Identifying and Assessing Emerging Risks in Marine Transportation. Masters Thesis, School of Marine and Environmental Affairs, University of Washington, U.S.A., 2016. Mode of access: https://www.itopf.org/fileadmin/data/Documents/Papers/Emerging_Risks.pdf

[43] UNCTAD. Structure, Ownership and Registration of the World Fleet. UN Symbol: UNCTAD/RMT/2013, Geneva: UNCTAD, 2017. Mode of access: https://unctad.org/en/PublicationChapters/rmt2017ch2_en.pdf

[44] Offshore Technology. Fighting Cyber Crime in the Offshore Oil and Gas Industry." December 13, 2016. Mode of access: https://www.offshore-technology.com/features/featurefighting-cyber-crime-in-the-offshore-oil-and-gas-industry-5692000/

oil started capturing global markets.[45] This was followed by heightening of the US-China trade war by mid-2019 that raised concerns of an impending global recession, further leading to a OPEC+ agreement in December 2019 to tackle that decelerating economic growth trend.[46] However, the agreement between the two largest oil producers, i.e. Saudi Arabia and Russia, was ruptured by the latter at the outbreak of COVID-19 pandemic in 2020,[47] prompting the former to ramp up oil production in a price war between the two,[48] thereby, the global markets getting flooded with dirt cheap oil.[49]

Reeling under such volatilities, all exporting countries have sought for predictability of energy demand and for stable flow of energy exports. Fair and reasonable prices are essential in the long run as it would attract further investment in energy exploration and infrastructure.

Energy revenues aid the development of these states as tax revenues from oil production fund governments. A steady and reliable stream of revenues is also essential for balancing the budgets of these countries, which rely heavily on revenues from energy imports. As a result of the global fall in the prices of energy, many countries are running current account deficits and are struggling to balance their annual budget.[50] This has also led to depleting foreign currency reserves and bleeding sovereign oil reserves which is a cause of concern for these countries. The large slide in the value of currency of Russia (Rouble), Venezuela (Bolivar) and Nigeria (Naira) provide ample evidence of the importance of energy revenues and the impact that the fall in international energy prices can have on the macroeconomic environment of a country.[51] It also leads to a decrease in consumption as well as investment and adds to other factors which contribute to a shrinking economy and may lead to a recession.

With the demand of energy falling in China energy exporters are keen to protect their market share and are also looking at diversification of their energy exports. Some of these countries also face the risk of sanctions and are increasingly concerned about their security of demand. The case of international sanctions on Iran imposed by the U.S. led coalition to limit its nuclear programme, capped the production of crude oil and allowed only eight countries to import oil from Iran, is a case in point.[52] Similarly, Qatar has been facing a blockade from Gulf countries after five of them severed diplomatic ties with it in June 2017, accusing it of supporting terrorism.[53] This may impact on the security of demand of liquefied natural gas of which Qatar is the largest exporter in the world, and hence it is a major cause of concern for the state.

[45] Whipple, T.; Andrews, S. Peak Oil Review / Resilience. December 26, 2018. Mode of access: https://www.resilience.org/stories/2018-12-26/peak-oil-review-26-december-2018-2/

[46] Financial Times. Oil Prices Plunge on New Trade War Fears 2019. August1, 2019. Mode of access: ttps://www.ft.com/content/097d4878-b487-11e9-8cb2-799a3a8cf37b; Ellyatt, H., Meredith, S.; Stevens, P. OPEC Meeting Ends with Market Expecting Deep Production Cut. CNBC, 5 December, 2019. Mode of access: https://www.cnbc.com/2019/12/05/opec-december-meeting-opec-production-cuts-in-question.html

[47] Thompson, M.; Defterios, J. Oil Prices Crash 9% as OPEC and Russia Fall out Over the Coronavirus Crisis // *CNN Business*. March 6, 2020, Mode of access: https://edition.cnn.com/2020/03/06/business/oil-prices-opec-disarray/index.html

[48] Yagova, O.; Gorodyankin, G. Saudi Arabia Floods Market with Cheap Oil to Squeeze out Russia / Reuters, March 12, 2020. Mode of access: https://gcaptain.com/saudi-arabia-floods-market-with-cheap-oil-to-squeeze-out-russia/

[49] Bhaskar, U. Oil Is Dirt Cheap, WTI Falls to $11 per barrel / Livemint, April 20, 2020. Mode of access: https://www.livemint.com/industry/energy/oil-is-dirt-cheap-wti-falls-to-11-per-barrel-11587405969092.html

[50] Financial Times. Oil-producing Nations Grapple with Latest Price Fall. April 22, 2020, Mode of access: https://www.ft.com/content/8e1fd8dc-e45d-4cee-b671-bae767f93e3b

[51] Strohecker, K. Currency Pegs in Nigeria, Oman in Peril After Oil Price Plunge // *Reuters*, March 14, 2020. Mode of access: https://www.reuters.com/article/us-emerging-markets-pegs-analysis/currency-pegs-in-nigeria-oman-in-peril-after-oil-price-plunge-idUS KBN210327

[52] Manson, K. US Exempts Eight Countries from Iran Oil Sanctions // *Financial Times*. November 5, 2018. Mode of access: https://www.ft.com/content/90adb102-e101-11e8-8e70-5e22a430c1ad

[53] Al Jazeera. Qatar-gulf Crisis: Your Questions Answered. December 6, 2017. Mode of access: https://www.aljazeera.com/indepth/features/2017/06/qatar-gulf-crisis-questions-answered-170606103033599.html#blockading-countries

Dilemma for energy transit states

An energy transit state is one that allows for the passage of energy resources, usually oil and natural gas, through its sovereign territory from an energy exporting country to an energy importing country. Such a state geographically lies along the route of an oil or gas pipeline, while both the source and the destination lie outside its own territory. A transit state voluntarily lets its land and sea territories (if it's a costal state) to be used for constructing a pipeline in return of a levy charged to both upstream and downstream parties. At present, there are many energy transit states around the world, some of which also act as energy importers in the process of transporting these commodities. Ukraine, Georgia, Turkey and eastern European countries are prominent examples of states that fall in this category and are strategically important for both energy suppliers and energy consumers as they facilitate import and export of energy.[54]

These states, assert control over the physical infrastructures, such as natural gas or oil pipelines, which pass through their territories and the pipelines becomes a valuable political and economic 'asset' for them. Hence, they rise to a position of a strategic significance where they may shape energy dynamics at the regional and global level. In order to limit the derived powers for transit states, international law has various provisions: some prescribing rules relating exports, imports and transit in general[55]; whereas others focusing on particular pipeline that delineates obligations for all participating states.[56] In essence, the privileges and powers at disposal for transit states come along with an array of responsibilities, both codified and customary.

The transportation of hydrocarbons via fixed infrastructures implies a long-term commitment for transit states. Transit states are bound for long duration by various legal provisions concerning to pipeline(s) to which they have officially given their consent. Some transit states that invest in cross country pipelines have to continually bear the risk of supply disruption and demand fluctuation, which affects the annual income which is derived from transit. Moreover, existing international treaties for energy transit do not guarantee a return on an investment for building a pipeline and does not spell out any entitlement as transit rent, unlike energy-endowed states that receive a rent for depletion of their national resources (WTO GATT 1994, Article 5).[57] All transit states therefore use their own discretion to avoid making a risky investment before building a pipeline passing through its territory. However, they have no reason to prevent a private investor from shouldering the costs of construction.

Approximately 70-75 per cent of Russian natural gas which ends in European Union countries transits through Ukraine.[58] The dispute between Russia and Ukraine has often resulted in the disruptions of gas shipments originating from Russia and transiting from Ukraine to European countries such as Bulgaria, Greece, Macedonia, Romania, Croatia and Turkey, even in the peak of winters.[59]

Transit states act as a physical bridge, and at times even barriers, between energy exporting and importing countries. These states therefore hold no less significance as energy

[54] Energy Charter Secretariat (ECS). International Energy Security: Common Concept for Energy Producing, Consuming and Transit Countries." Brussels, Belgium: ECS, 2015. Mode of access: https://www.energycharter.org/fileadmin/DocumentsMedia/Presentations/CBP-KZ-CN.pdf

[55] Article V of the GATT 1994 allows only reasonable transportation charges that includes opportunity costs of invested capital or a reasonable profit, but nothing more. In principle, it prohibits customs duties, transit duties and other transit-related charges.

[56] Embassy of the Republic in Turkey (ERT). Energy Issues. Washington, DC, USA: ERT, 1999.

[57] World Trade Organization. The General Agreement on Tariffs and Trade (GATT 1947), Geneva, Switzerland: WTO. Mode of access: https://www.wto.org/english/docs_e/legal_e/gatt47_01_e.htm#articleV

[58] RadioFreeEurope/RadioLiberty. Fresh EU-Russia-Ukraine Gas Talks to Take Place in Brussels. October 28, 2019. Mode of access: https://www.rferl.org/a/fresh-eu-russia-ukraine-gas-talks-to-take-place-in-brussels-as-winter-approaches/30239786.html

[59] Kovacevic, A. The Impact of the Russia-Ukraine Gas Crisis in South Eastern Europe. Oxford Institute for Energy Studies, 2009. Mode of access: https://ora.ox.ac.uk/objects/uuid:6647d112-afaf-4d26-9ca6-afd90db56dad

exporting and importing states as they are vital components of the global energy supply chains. Therefore, these states need to be put at a level-playing-field with other states in the 21st century energy game.

Apart from the security of physical infrastructures, these states need to ensure a favourable domestic political environment which would enable unhindered flow of energy. However, there are no clear and detailed globally accepted standard rules for negotiating transit fees and the terms of the agreement and these are negotiated across the table with each side attempting to extract the maximum benefit. This puts the transit state in a complex and sometimes (dis)-advantageous position to independently tackle both energy importing and exporting state so as to maintain the security of supply as well as demand, while extracting the maximum rent from the transit service.

Hence, global energy security challenges also need to viewed from the prism of transit states, and not only through the lens of energy importing or energy exporting countries. Such a holistic view, which takes into account the security concerns and interests of energy transit states, is likely to enhance global energy security.

Prioritising energy interdependence over energy independence

Energy independence was a norm till the 19th century and most countries were primarily dependent on locally available biomass and coal for meeting their energy needs. With industrialisation kicking in, there was a sharp increase in the demand for energy and countries began to look outward to meet their burgeoning requirement for energy. As oil gained importance as an energy source, mainly due to a lack of suitable energy alternatives in the transportation sector,[60] the demand for imported oil grew at a faster pace than other commodities. In recent times, natural gas, a cleaner fuel, has begun to be widely used as a fuel in electricity generation as well as in industry and for residential heating.[61] This has led to an increase in the use of natural gas, further increasing the countries energy import dependency. In present times, energy markets for trade for these commodities have further got developed and economics of demand and supply have dictated their floating prices, except on limited occasions when the markets became dysfunctional due to specific external factors.

Spot market transactions and long term (future) contracts backed by legal tenders are becoming the new order of the day. Such arrangements have led to liquid commodity markets where the security of financial transactions is provided by the global financial system. However, there have been instances when the financial system has been jolted due to different reasons, such as financial (or associated) irregularities in any one or more sectors of the global economy or in the national economy of a major country. E.g., the present lockdown of national economies arising due to the COVID-19 pandemic has resulted in a closure of travel, manufacturing and other activities in the supply chain leading to a global oil price crash.[62] On the other hands, the crisis in real estate/ housing sector in the US, which started by mid-2007, led to the global financial crisis (GFC), considered to be one of the biggest crisis since the Great Depression of the 1930s.[63]

Under such unsustainable market conditions, all states face an urgent need to build effective and coordinated international cooperation for achieving national energy security. They need to work towards creating a security arrangement, both at the world level and within their national territories, which incorporates sustainability along the entire

[60] EKT Interactive. History of oil. Mode of access: https://www.ektinteractive.com/history-of-oil/

[61] Union of Concerned Scientists (UCS). Uses of natural gas." Cambridge, MA, U.S.A.: UCS, 2014. Mode of access: https://www.ucsusa.org/resources/uses-natural-gas

[62] Saefong, Myra P.; Watts, W. Oil Prices Mark Lowest Finish in 2 Weeks as COVID-19 Outbreak Rattles Demand Expectations / MarketWatch, February 25, 2020. Mode of access: https://www.marketwatch.com/story/oil-edges-lower-sees-additional-selling-after-monday-drop-2020-02-25

[63] Eigner, P.; Umlauft, T.S. The Great Depression (s) of 1929-1933 and 2007-2009? Parallels, Differences and Policy Lessons. Parallels, Differences and Policy Lessons. Hungarian Academy of Science MTA-ELTE Crisis History Working Paper, 2015, No. 2, Mode of access: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2612243

length of the supply chain, starting from where energy is produced and processed (stored and refine) to transporting through large areas and being consumed by end-users, both small and large utilities. Furthermore, at a time when damages to the environment caused by human activities have resulted in a previously unexpected crisis of the range of COVID-19 pandemic,[64] states need to work towards embedding sustainability in all sectors of their national economies connected to energy.

Energy interdependence can, therefore, be considered as a key to global energy security and its advantages overshadow those gained by following a policy of energy independence. These can be summed up as follows:

(i) Energy trade is an enabler of stability

Energy trade leads to economic dependence which strengthens political relationship as all participating countries benefit. Increasing dependence leads to a series of confidence building measures. This further leads to an alignment of national interests and often results in formal and informal security arrangements between the partner countries leading to stability. E.g. SIEPAC (Central American Electrical Interconnection System), complimenting and clearing the way for realizing of the 'Central American Peace Accord' in late 1980s.[65]

(ii) Energy interdependence is a harbinger of prosperity

In a dynamic environment where technology has the potential to bring disruptive changes, energy trade leads to prosperity. Such an example can be vividly seen in the case of the Nordic region, where the countries, namely Sweden, Norway, Finland, and Denmark, have shared electricity pooling (Nord Pool) and close cooperation on energy policy.[66] This has resulted in improving operational efficiency and reduction in overall cost of energy trading among the countries.

(iii) Energy imports lowers the cost of energy for energy deficit countries

Energy interdependence is beneficial for both energy producers and consumers. Energy deficit countries get energy at a price which is significantly lower than it would cost if they would have relied on domestic energy sources, including harnessing renewable energies which also carbon footprint.[67] Similarly, for energy exporters, the produce is sold at prices which are higher than what it would have fetched in the domestic market.

(iv) Energy interdependence is essential for sustainable development

Energy is a prerequisite for sustainable development and providing energy access is critical for meeting the global development

[64] International Union for Conservation of Nature (IUCN). IUCN statement on the COVID-19 pandemic. Gland. Switzerland: IUCN, 2020. Mode of access: https://www.iucn.org/news/secretariat/202004/iucn-statement-covid-19-pandemic

[65] In 1987, SIEPAC (Central American Electrical Interconnection System), an interconnection of the power grids of six Central American countries- Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama- was conceptualized as an initiative of Central America Electrification Committee (CECA), one of the founder institution created in 1979 for driving up regional integration in region. SIEPAC was designed to bring the benefits of electricity market integration to the member countries and to improve their national power systems. Due to the relatively small size of the power system in each of the region's nations, the opening of the regional market was seen as a means for creating a larger market to enhance competition among power producers and for providing a secure supply of power to all individual countries at the same time. Lopez, Humberto J.; Shankar, R. Getting the Most out of Free Trade Agreements in Central America. Washington DC, U.S.A., 2011. In August 1987, the presidents of 6 Central American countries - Costa. Rica, El Salvador, Guatemala, Honduras and Nicaragua- signed the Central American Peace Accord, known as Esquipulas II. It was designed to promote national reconciliation and negotiate with guerrilla groups to end all fighting. Hence, an evident link comes up between electricity market integration initiative and the political peace agreement.

[66] Amundsen, Eirik S.; Bergman, L. Why Has the Nordic Electricity Market Worked so Well? // *Utilities policy*, 2006, No. 14(3), pp. 148-157; Nordic Council of Ministers (NCM). Nordic programme for co-operation on energy policy 2018–2021. Riga, Latvia: NCM, 2017. Mode of access: https://norden.diva-portal.org/smash/get/diva2:1164558/FULLTEXT01.pdf

[67] Adams, S.; Nsiah, C. Reducing Carbon Dioxide Emissions; Does Renewable Energy Matter? // *Science of The Total Environment*, 2019, Iss. 693.

agenda. Energy has been called as the golden thread which binds all other goals and therefore UN Sustainable Development Goal (SDG) 7: "Ensure access to affordable, reliable, sustainable and modern energy for all" is considered vital to meet other SDGs.

(v) Global integrated markets lead to discovery of the right price for energy

Functional energy markets tend to provide market clearing prices which are pareto-optimal and an energy market with a large number of buyers and sellers lead to a deep and liquid market. In such a situation market clearing prices are discovered based on the economics of supply and demand and right price signals drive further investments into energy exploration and production.

(vi) Energy interdependence increases resilience to energy supply and demand disruptions

Energy disruptions are inevitable as uncertainties of various kinds and nature, including but not limited to political, economic and natural/environmental, increase globally. Energy interdependence increases resilience of participating stakeholders to energy supply and demand disruptions. This prevents one single disruption within a territory or sector to morph into a global energy shock, thereby enhancing energy security.

Mechanism to strengthen energy security

The framework to provide global energy security needs to be comprehensive and compact, and not fragmented and distinctive as it stands at present. This means that energy security needs to be premised on international cooperation at all levels and in different sectors of the global economy which fosters interdependence between all states. Such an approach is important as the world has witnessed an exponential rise in energy supply in recent years and yet large section of humanity have not been able to meet their basic energy needs. Further, energy contestation between states has neither been able to provide global energy security nor it could transform any niche development (energy technology related) as a breakthrough success in the global markets, thus altering the nature of its entrenched characteristics.[68] Energy cooperation among states therefore need to be prioritised and sustained to provide energy security, whilst ensuring energy sustainability remains a part of that. This will ensure that the global energy system is able to respond to various challenges so as to produce and provide reliable, clean and affordable energy to all.

While there are many contradictory interests of stakeholders such as energy suppliers, energy consumers and the transit countries, there are some convergences of interests. Stability in prices in the long run, functional energy markets without major price distortions, minimising the risk of disruption of energy supply and timely clearing of financial transactions are some of the factors which are in the interest of all parties and lead to an increase in global energy security. A diversification of energy mix to have a larger share of renewable energy also increases energy security while having significant co-benefits such as lowering air pollution and GHG emissions. Some of the actions which can be taken by individual states for increasing global energy security are mentioned below. These suggested measures are desirable and beneficial for a sustainable future, but not exclusive.

Supply side measures:

(i) Diversification of types of energy sources, including within fossil energy, origin and transportation routes.

(ii) Ensuring security of energy supply through resource ownership and political partnership/ engagement, both within national territories and in other countries.

[68] The regime in the multi-lateral perspective (MLP), a middle-range theory for analysing socio-technical transitions to sustainability, is characterised by competition and contestation between states (actors in the regime) for achieving national energy security. MLP recognizes the interests and the role power of the regime's actors (e.g. by examining contestation between vested interests). The contestation and prevalence of regime's actors has prevented the uptake of new technologies (niche developments) that may offer additional benefits to the people and global markets. Geels, Frank W. Regime Resistance against Low-carbon Transitions: Introducing Politics and Power into the Multi-level Perspective // *Theory, Culture & Society*, 2014, No. 31(5), pp 1-40.

(iii) Increasing the ability to transport energy through modern ships and advanced pipelines.

(iv) Protecting critical cross border energy infrastructures.

(v) Developing infrastructures for additional capacity for energy imports, that includes advanced energy storage systems (AESS).

(vi) Increasing use of alternate energy sources.

(vii) Integration of renewable energy in national electricity mix.

(viii) Decentralized electricity grids (both at locale and provincial level) and increasing cross border electricity exchange.

(ix) Stockpiling of emergency reserves in form of strategic oil reserves.

(x) Bilateral and regional arrangements for sharing strategic oil reserves.

Demand side measures:

(xi) Providing access to cheap, clean and modern energy to all consumers.

(xii) Controlling the demand of energy by appropriate disincentives for excessive energy use.

(xiii) Improving energy efficiency of appliances through application of new technologies and encouraging best energy practices.

(xiv) Mandatory standards as well as incentives for improvement in energy efficiency.

(xv) Promoting energy competitiveness in national as well as global firms and industries.

Measures internal to the system:

(xvi) Improving energy conversion efficiency and grid distribution efficiency.

(xvii) Stable regulatory framework backed by territorial and international law which exist as complimenting to one another.

(xviii) Grid management and smart forecasting of energy supply, demand and transit flow.

(xix) Empowering end consumers, both private and commercial, to rise to a position of making conscious decisions related to energy, including consumption, re-distribution of saved energy and participation in energy policy legislation and execution.

(xx) Building independent institutions for providing oversight, advisory and governance on energy cooperation matters.

(xxi) Sharing of best practices and global standardization of applied technologies.

Pricing measures:

(xxii) Encourage deep and global energy markets with minimal price distortions

(xxiii) Stable energy pricing policy determined consensually with participation by all states

(xxiv) Climate-energy forums, such as United Nations Conference of Parties (CoP), Montreal Protocol, etc., play a greater role in determining the pricing of energy and mandatory carbon reporting and emission reduction performance.

(xxv) Consolidated regional markets and free trade arrangements for unchecked energy trade.

Conclusion

Till at present, states have viewed energy security from the narrow prism of satisfying national energy security needs, and especially so from the viewpoint of uninterrupted energy consumption at an affordable price. However, changing circumstances call for an overhaul of this strategy towards ensuing due care to meet the energy security needs of other states, both neighbouring and faraway that they are connected in the global supply chain (including energy suppliers). It is through coordinated international cooperation that all states can address the concerns and interests related to their national energy security and strengthening global energy security at the same time. This inclusive approach will drive up the economic development of all states within the existing framework of SDGs. Such a transformed arrangement will not come up unless all states committedly work towards meeting the present and future energy needs of mankind, whilst keeping aside their political differences and economic interests. Also, the people at large, i.e. the end consumers of energy who are also the physical extension of the states, will need to play an active role in participating as well as advocating towards building energy cooperation for achieving sustainable energy security under changing global circumstances.

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МЕЖДУНАРОДНАЯ ВЗАИМОЗАВИСИМОСТЬ В ОБЛАСТИ СОВРЕМЕННОЙ ЭНЕРГЕТИЧЕСКОЙ БЕЗОПАСНОСТИ

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Ключевые слова:
энергетическая безопасность;
энергетическая взаимозависимость; энергетическая устойчивость;
ископаемое топливо;
энергетическая геополитика

Аннотация: Энергетика остается основой мировой экономики в настоящее время, и конкуренция в данной области тесно связана с проблемой энергетической безопасности. Государства, крупные и малые, участвуют в гонке за энергетическую безопасность для национального развития; однако они упускают возможность накапливать выгоды от большей взаимозависимости и сотрудничества между ними. В статье обосновывается тезис о том, что государства, когда изменение климата проявляется в новых формах, а волатильность на мировых нефтяных рынках находится на рекордно высоком уровне, должны пересмотреть свое понимание и применение энергетической безопасности в соответствии с реалиями. Энергетическая безопасность на международном уровне может быть достигнута за счет совместных корректировок в цепочке поставок, включая государства-поставщиков, транзитеров и стран-потребителей, для усиления взаимозависимости. Эти корректировки позволят государствам изменить свое положение и оптимально действовать в мировой торговле энергоносителями.

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