

CROSS-BORDER ENERGY TRADE (CBET): AN IMPETUS TO SOUTH ASIAN COOPERATION

A.L. Kurian

School of International Relations and Politics, Mahatma Gandhi University, P.D Hills,
Kottayam, Kerala, India
liskurian@gmail.com

ABSTRACT

Regional cooperation unveils a perfect avenue to engender sustainable growth by means of developing and sharing resources in any region of the world. In the case of energy sector, this is particularly applicable to South Asia as the region has tremendous potential in renewable energy sources like hydropower, wind power and solar power almost underexploited till date. Such agglomerations will help countries to strengthen national energy security, reduce the costs of energy supplies and minimize adverse impacts from energy price volatility. This will involve a multitude of actions including establishment of cross-border infrastructure and knowledge sharing. South Asian countries are struggling to ensure adequate energy services both as a foundation of growth and as a means to climb out of severe poverty. However, ambitious and participatory regulatory framework to recognize benefits and to drive investment from beneficiary countries is lacking. It is important that the necessary market arrangements such as an extension of the power exchanges between countries to embrace cross-border trading, are the need of the hour to quicken the development of interconnectors to reap benefits and also to annul 'energy trilemma' of ensuring energy security, affordability and sustainability in the region. South Asian nations recognised Cross Border Energy Trade (CBET) as the best option to harness its renewable energy sources as well as to meet the demand and supply energy imbalances in the region and beyond. Thus this paper analyses the functioning and significance of CBET in the South Asian scenario.

Keywords: Cross-Border Energy Trade (CBET), SAARC, Regional Cooperation, South Asia.

Introduction

South Asia is a dynamic and complex region that presents the world with significant opportunities and challenges to global security, stability and human well-being. It is one of the fastest growing regions in the world with an average growth rate of above 5-6 percent over the past two decades and has demonstrated its potential for emerging as a significant economic entity in the world economic space. The region is home to India, the world's largest democracy and a rising power with one of the fastest growing economies. It also includes governments struggling to maintain control of their countries, two nuclear powers that coexist in an uneasy and often tense relationship and conflicts with al Qaeda and Taliban forces. These factors make the region a subject of considerable strategic importance to the major powers and the larger international community. South Asia covers 3.3 percent of Earth's terrestrial area, but supports more than one-fifth of the world's inhabitants. Covering at least 1.5 billion people across India, Pakistan, Bangladesh, Nepal, Sri Lanka, Bhutan, Maldives and Afghanistan, SAARC is one of the largest regional organizations in the world.

But its achievements so far have been so minimal that even its constituents have become lackadaisical in their attitudes towards it. Geography coupled with high levels of poverty and population density has rendered South Asia especially vulnerable to the impacts of non-traditional challenges (Muzaffar *et al.* 2017; Jamil *et al.* 2020). Regional cooperation has possibilities to exploit country-specific resource complementarities and demand characteristics. In the case of energy, South Asian nations continue to witness energy deficits and energy security issues like poor electricity access and power shortages amidst sufficient renewable energy resources in the region. South Asian countries can harness renewable energy resources in an innovative manner to meet energy requirements at decentralised locations thereby push up regional economic growth (Nag 2019; Vaidya 2019). Countries across the region can benefit meaningfully by strengthening the mechanism of energy trade through enhanced connectivity. Thus, better energy cooperation within South Asia will be one of the most effective ways to deal with regional energy deficit and to ensure energy security in the Region and beyond (Singh 2013).

In the background of climate change and sustainable development, international community is moving away from overwhelming dependence on fossil fuel and within the fossil fuels, away from coal and oil in favour of gas. Globally, in the year 2005 the total share of fossil fuels in the primary energy mix was 88 percent but it fell to 86 percent in the year 2015. And, the share of oil has fallen from 36 percent to 33 percent whereas natural gas has increased from 23 percent to 24 percent. At the same time renewable energy including nuclear and large hydro has gone up from 12.5 percent to 14 percent in the period 2005-15. The above trends are anticipated to be maintained and sharp decline in the prices of wind and solar technologies in recent years by about 60 percent and 52 percent respectively between 2010 and 2015 (in kWh terms), has led to a change in the relative significance of energy resources (NEP 2017).

Materials and methods

The paper has followed historical analytical method for analysing the role of Cross-Border Energy Trade (CBET) in South Asian cooperation. The data on various dimensions of Cross-Border Energy Trade (CBET) in South Asia was collected from various sources such as government reports, articles, books and web resources.

Results and Discussion

Renewable energy sources for power generation are becoming more popular worldwide as a means to fight against new security challenges such as climate change, energy security etc. International Energy Association (IEA) has classified three generation of renewable energy sources:

- i. First-generation technologies include biomass, Hydroelectricity plus geothermal power;
- ii. Second-generation technologies comprises solar heating, photovoltaic (PV), wind power, solar thermal power station also modern form of bio-energy; and
- iii. Third-generation technologies consist of advanced biomass gasification, bio-refinery technology as well as ocean energy (Pranti *et al.* 2013).

Renewable energy has certain advantages over conventional fossil fuels in the present global scenario which are the following:

- i. Once the infrastructure has built for the generation of renewable energy then the fuel is free of cost that means only capital cost needed and no operating cost occurs;
- ii. The fuel availability for the renewable energy plant operation are boundless and never be terminated;
- iii. There is no environmental pollution for this power generation in comparison with fossil fuel power generation;
- iv. The locally generated energy eliminates transmission and distribution costs;
- v. In the day of increasing electricity demand, renewable energy can decrease the need for commercial use of fossil fuels which is used in industries to satisfy the economic development of the country;
- vi. After the installation of infrastructure, minimum maintenance and operating person is required,
- vii. Utilization of renewable energy technology gives relief to fossil fuel deficient countries from fuel import thereby supports the economy to grow,
- viii. Use of renewable energy diminishes the global Green House Gas (GHG) emissions and decreases environmental pollution and
- ix. A PV panel with wiring system costs \$100 which can charge a car battery and after that provide power to run a fluorescent lamp or a small television for a few hours per day (Pranti *et al.* 2013).

Driven by rapid technology advances, the global shift towards renewable energy is well apparent thus, South Asia's energy future depends on how it leverages its advantages in renewables and takes part in the global trend. The available renewable energy sources in South Asia have the potential to play a central role in the future energy mix of the region. Today, renewables are recognized not only as an alternate source of energy but also as an apparatus to confront other pressing needs such as reducing the health as well as environmental impacts concomitant with fossil energy, mitigating greenhouse gas emissions and providing socio-economic benefits (ESCAP 2018). The exploitation of large renewable

energy capability of the expanse particularly the enormous hydropower resources in Nepal as well as Bhutan is critical in the exertions of electricity industry to satisfy the fast expanding demand in the region at the lowest cost with least possible impact on environment and ensure energy security (Wijayatunga 2015).

In South Asia, the renewable energy production, both in total energy consumption as well as in electricity has augmented in absolute terms during the past two decades. Interestingly, the installed capacity of renewables is only a fraction of the total potential renewable energy resources that could be harnessed. However, better policies are vital to accelerate transitions to renewables and to evade exploiting the economically cheap but unsustainable carbon-based fuels. Cross-border Energy Trade (CBET) based incentives to transition from carbon-based fuels can better distributes the country based renewable capacity to consumers across the region. The scope of diversification into other renewable sources beyond hydropower such as solar and wind energy is higher than ever before on the pretext that the cost gap between electricity generated from renewables and from fossil fuels is narrowing rapidly. There are numerous advantages South Asia offers in adopting renewable energy, some of the benefits are: First, the sub-region offers some of the world's highest quality and most extensive wind and solar resources in addition to hydropower. Secondly, renewable energy costs in the sub-region are extremely competitive by offering some of the lowest installed costs of renewable energy systems worldwide. Third, it is the fact that much of the energy consumption or production infrastructure that will exist in 2030 has yet to be built, allowing South Asian countries to leapfrog to more advanced technologies, both on the generation as well as on the demand side (ESCAP 2018). Four, the abundant renewable resources, the intersecting geography of the South Asian countries and the short transmission interconnection distances offer greater opportunities than in many other regions. Five, the renewable energy resource potential of the region indicates that eventually South Asia could meet up to 100 percent of its electricity needs through renewables helped by

declining costs, interconnection and supportive policies (ESCAP 2018).

Energy Trade in South Asia

The criticality of the energy sector in the economic development of individual nations and the South Asian region as a whole is paramount. So, it is significant that to ensure the development aimed for is sustainable and the actions taken to enhance plus improve the energy sector are based on renewable energy sources. Regional cooperation is vital in achieving developmental targets and contributes to the collective development through sharing of resources as well as avoiding regional conflicts based on natural resources (SARI 2018). In 1980 total primary energy consumption in South Asia was 1.7 percent of the total world energy consumption which grew 2.36 percent in 2006. In the midst of the drastic increase in the energy consumption internationally, this region still remains in the lowest per capita energy consumption region on the earth. Most of the rural people of this region use non-conventional form of energy and a significant number of them depend on biomass. In 2008, biomass was used for meeting 80 percent residential energy needs and it is also expected to remain 70 percent in 2020 (Pranti *et al.* 2013).

In the background of the interconnection between economic growth and energy demand; access to adequate, affordable, reliable and high-quality energy services are considered as one of the key inputs needed to sustain as well as accelerate economic growth in the area. The resources used and required to generate power in terms of energy security is a major concern in the region. The installed capacity (MW) from different sources depicts that the energy sector of the region is predominantly governed by certain features such as the dominance of single fuel in energy, limited exploitation of renewable energy resources and a high dependence on traditional fuel. And these are common characteristics applicable to all the individual domestic energy sectors in the expanse. It should be noticed that the domestic resource development pace in the South Asian countries together with existing regional bilateral energy trade arrangements will not

balance the mounting commercial energy supply required in the region. Hence, it is obvious that these nations are in great demand of augmenting their regional energy transfer as well as to enhance their access to energy resources from outside the region and leverage economies of scale in energy procurement through a more vibrant intra plus inter regional energy trade network (SARI 2018).

Underneath the auspices of South Asian Association for Regional Cooperation (SAARC), a process aiming at energy cooperation has begun in 2000. In 2000, Technical Committee on Energy formed and in 2004, Specialized Working Group on Energy launched. In 2005, first meeting of energy ministers conducted at Islamabad where an Expert Group on energy conservation and efficiency and Roadmap for SAARC region established. Again, in 2006 the SAARC Energy Centre has been founded at Islamabad. On 5 March 2007 South Asia Energy Dialogue held which suggested recommendations to promote energy cooperation. The notion of an 'Energy Ring' has discussed at Colombo in 2009 and in the same year the fifth meeting of Working Group held which launched expert groups on a) oil and gas, b) electricity, c) renewable energy, d) technology and knowledge sharing. In 2010 Concept of SAARC Market for Electricity came into existence in the 16th SAARC Summit Declaration (Gippner 2010).

Regional energy trade in any region endows with copious advantages: (i) supports to overcome the mismatch between energy demand and energy resource endowments among the nations in the region specifically, among neighbouring countries; (ii) enhance energy security through prudent reliance on trade to meet part of the demand by diversifying the forms of energy access and supply sources with possible lowering of the average cost of supply; (iii) enable smaller countries with large natural resources such as hydropower to develop that resource exploiting economies of scale; (iv) helps to postpone, reduce or avoid large and lumpy capital investments in new production facilities thereby overcome temporal cash flow glitches; (v) promote public-private partnership arrangements thereby enhancing private sector

participation in the energy sector; and (vi) seizure of environmental benefits by enabling the substitution of planned higher per electricity unit pollutant emission projects in one power grid with lower per electricity unit pollutant emission projects in an interconnected power grid (Wijayatunga and Fernando 2013).

SAARC developed the Framework Agreement for Energy Cooperation (2016) to enable its member states to conduct cross border electricity trade. This Agreement sanctions among others for authorized entities of the SAARC member states to buy and sell electricity within the region, to negotiate the terms and conditions, payment security mechanism and tenure of the electricity trade, subject to regulation by the laws of the concerned member states to consider exempting export and import duties and other fees for cross border trade and exchange of electricity. The Agreement will further offer non-discriminatory access to the regional transmission grids in their respective states. Negotiations through bilateral, trilateral or regional agreements will be conducted among member states in installing cross-border transmission lines and cross-border interconnections for cross-border electricity trade. Also, it envisions setting up of system operations and settlement mechanism, a regulatory mechanism and a dispute settlement mechanism. The member states will be provided with the opportunity to review the commitment to the Agreement on a five year basis, from the date of entry into force. The Agreement also provides for knowledge sharing and joint research in Electricity Sector, Member States which may enable and encourage knowledge sharing and joint research including exchange of experts and professionals related to, inter alia power generation, transmission, distribution, energy efficiency, reduction of transmission and distribution losses (SARI 2018).

South Asia Sub-regional Economic Cooperation (SASEC) 2016-2025 concentrates on different aspects which contribute to the country's development. In its component on the energy sector, the SASEC deals with issues such as the dominance of a single fuel for electricity generation and growing import

dependence; the need for capacity expansion as well as diversification of energy sources to meet energy needs; poor energy infrastructure that limits the potential for cross-border trade; absence of harmonious policy frameworks that could enable the development of a regional power market; restricted use of renewable energy potential; weak institutional and co-ordination capacities; and dearth of funds in the public sector to undertake capital intensive projects. It also emphasizes on easing of supply constraints through improving energy trade infrastructure. This includes the expansion as well as diversification of energy sources to meet increasing demand resulting from economic growth and rising per capita incomes. It also focuses on energy trade infrastructure which is needed to enable the SASEC nations to access commercial energy sources. Further, the strategy relates to developing the regional power markets in South Asia as a long-term goal. This is intended to build on the expansion of bilateral energy trade arrangements between Bhutan and India, India and Nepal along with Bangladesh and India into a multilateral trade arrangement within a regional framework. However, developing a regional power market would require developing legal and regulatory aspects, transmission systems, security and stability standards and coordinating power generation scheduling as well as dispatch procedures. There would also be the need for harmonizing legal and regulatory frameworks as well as technical and institutional procedures (SARI 2018).

The SASEC energy strategy has also its focus on developing low-carbon alternatives and energy efficiency and conservation measures. The countries of the region possess abundant renewable energy resources like wind power and have taken initiatives to develop them on a commercial scale. However, wind and solar capacity do not serve as a replacement for conventional energy with the hourly variation of output in a day making it difficult to forecast wind and solar generation, for which the technology is still being developed. Further constraints faced include high transmission charges and difficult to afford net cost for renewable generation. In order to address this, SASEC Plan suggests sharing of the renewable

energy development practices for technology and knowledge transfer. In order to diversify the energy mix for each of the countries, the SASEC energy sector further recommends on operational priorities like improving interconnections to access large-scale electricity and natural gas sources, harnessing unused regional indigenous hydropower potential, developing low-carbon alternatives including wind plus solar and facilitating bilateral as well as regional co-ordination mechanisms and knowledge sharing such as technology transfer development practices towards the regional power trading market (SARI 2018).

Energy interconnections in South Asia have become a major focus in the sustainable development of the energy sector in the countries of the region. Regional cooperation on energy and Cross Border Electricity Trade (CBET) is considered as a tool complementary to purely national programs and policies in pursuing national goals. Besides, it has given rise to several frameworks such as bilateral trade agreements as seen between and other multilateral agreements manifest in the SAARC Framework Agreement of Energy (Electricity) Cooperation to which eight countries are Party to. Amongst the dynamics that facilitate regional cooperation in South Asia, the most significant characteristic of the region is the variation in the energy demand and supply condition. Diversity in demand profiles of South Asian countries with the non-coincident demand peaks across the year and difference in the daily load curve bestows opportunities for optimizing the load-generation balance across the region through a mutually beneficial power exchange mechanism among the countries of the region. In the assessment of the limitations in the capacity of reserves in the region leading to supply shortages founds that CBET would benefit the region by reducing costs of maintaining the reserves through interconnected power systems across the expanse. Nations with smaller economies in the region met an opportunity to reach economies of scale in generation and investment by the integrated resource development (SARI 2018). Additionally, the region is bestowed with diverse energy sources including limited

capacity of conventional energy resources and with huge capacity of untapped renewable energy potential like solar and wind renewable energy sources which are not realized due to various reasons such as lack of requisite technological capacities, high capital cost of infrastructure and higher energy prices from these sources. Through regional cooperation in energy, the untapped potential for renewable energy in the region can be harnessed in an unpredictable manner. Solar plus wind power potential in the region could be effectively exploited for the optimum utilization of clean energy sources. CBET would benefit countries with limited resources to satisfy its seasonal electricity needs in a sustainable manner through an effective exploitation of renewable energy potential via cross-border integration of the electricity systems. Thus energy cooperation can help to tap the available hydro as well as renewable resources and to improve the system's efficiency by exploiting opportunities to trade electricity (SARI 2018).

Cross Border Energy Trade (CBET) in South Asia

Cross Border Energy Trade (CBET) covers a multitude of technical, operational, ecological, socio-economic sector doles including improved energy security and reliability, optimized transmission network with reduced environmental impacts and GDP gains. The research on Cross-Border Electricity Trade in South Asia embodies the advantages of CBET under three broad categories such as operational benefits, economic benefits and environmental benefits.

- i. *Operational Benefits*- would arise through the optimization of the available resources through robust system integration based on rational planning and execution.
- ii. *Economic Benefits*- CBET can propel the economies of South Asian countries with gains like cost effective power availability, high export income due to power export and reduced exposure to volatile international energy prices leading to a reduction in the buying of energy from outside.
- iii. *Environmental Benefits*- Environmental sustainability would be a key outcome from enhanced CBET in the region which include

lower environmental impacts by tapping the significant untapped hydropower capacities in the region, enhanced electricity access would help to minimize the usage of kerosene thereby reducing indoor air pollution and fast tracking of the development of other renewable energy generation resources in the region through sharing of industry practices among the CBET members would help preserve the conventional sources for the future (SARI 2018).

Recent developments in South Asia, including rapid expansion of wind and solar generation have the potential to increase the incentives for cross-border energy trade (CBET) between India and Sri Lanka. First, India is projected to have excess power in most regions of the country by the mid-2020s which offers an incentive for India to increase return on investments through trade while also presenting an opportunity for neighbouring countries to gain access to a large power system diverse energy resources. Second, Sri Lanka's power system planners are valuing options for new sources of supply to address escalating pleas. Imports through CBET could increase available supply and potentially avoid the need for investments in new thermal generation capacity. Third, falling technology costs and national energy policies have led to significant growth in renewable energy investments in the region, with much more expected in the coming years. Synchronized regional trade can facilitate renewable energy amalgamation by leveraging the geographic diversity of weather over a broader area to reduce variability of wind and solar generation and by increasing access to resources available for balancing (Rose *et al.* 2018).

The proposal to connect India and Sri Lanka with a high voltage direct current (HVDC) transmission link is a novel initiative. The Asian Development Bank opined that the benefits from cross-border trade in avoided capital and operating costs and increased reliability for both countries would outweigh the project's cost. These studies, along with an analysis of trading opportunities by the South Asia Regional Initiative for Energy Integration (SARI/EI) and the Integrated Research and

Action for Development (IRADe), find the line could allow Sri Lanka to import power during peak periods and export excess base load power to India during off-peak hours (Rose *et al.* 2018). National Energy Policy of India states that fostering Cross Border Trade of Petroleum Products and Electricity especially with neighbours (Nepal, Bhutan, Bangladesh, Myanmar, Sri Lanka, China and Pakistan) which would enhance its energy security and by 2040 India will be an active energy trader with its neighbours (NEP 2017).

The Memorandum of Understanding (MoU) on a Feasibility Study for India-Sri Lanka Electricity Grid Interconnection was signed on the 9th June 2010 to conduct a feasibility study for the interconnection of the electricity grids of the two countries. A prefeasibility study was conducted by Nexant Inc./Power Grid Corporation of India with the assistance of USAID in 2002 and a review of the prefeasibility study was carried out in 2006 with the main objective of providing the necessary recommendations for implementation of 1,000 MW HVDC interconnection project. The study concluded that the cross-border interconnection would benefit to both the countries. The technical feasibility study for the Project has been completed in September 2011. The study has evaluated three construction options and two technology options namely current source converter (CSC) and voltage source converter (VSC) (Rodrigo and Fernando 2018).

With the increasing demand for energy in order to address the Sri Lanka's economic and social development, the total primary energy demand is steadily increasing. Electricity and petroleum sub-sectors are likely to record higher annual growth rates of about 7-8 percent (SARI 2018). However, hydro electricity production and biomass-based energy supplies in Sri Lanka are expecting only slight increase in the near future. Thus imported fossil fuels are the only option. In the longer term, possible development of indigenous petroleum resources and accelerated development of non-conventional renewable energy are likely to make a significant change in Sri Lanka's mix of primary energy resources (SARI 2018). The Indian government has the plans to fully

desegregate the national grid and double the interregional transmission capacity.

CBET is a burgeoning concept across South Asian region with wide stakeholder engagement incorporating multitude of sectors. Moreover, the studies reveal that the scope of CBET in the future will be more market-oriented which will require inter-regional transmission capacities. At present, other CBET initiatives in the region include Bhutan-India additional grid reinforcement; India-Nepal 400 kilovolt transmission link under construction; proposed India-Sri Lanka high voltage direct current transmission link which includes a submarine cable component; Bangladesh-India high voltage director current transmission link which was commissioned in 2013; and India-Pakistan 400 kilovolt transmission link coupled with CASA 1000 transmission link (SARI 2018). In this scenario the CBET has prognosticating effect for the entire South Asia in terms of income and employment generation, production system, balance of payments, import-export revenue, infrastructure development etc.

Conclusion

Regional cooperation and integration has vast potential for accelerating economic growth which is peculiarly significant in the context of energy cooperation in South Asia. The South Asian region is undergoing rapid transformation consequent with globalization and powered by the dynamic growth of the Indian economy. It should be noted that it is the fastest growing region in the world. However, the region continues to remain among the least integrated expanses of the world. South Asia can be propelled faster to find its rightful place in the world if its member states develop greater regional cooperation and connectivity. The concept of regional cooperation slowly gained exuberance in South Asia and during the 1970s that various political and economic factors created simpatico environment for it. SAARC has survived and grown in its activities over the years despite heterogeneous levels of economic development as well as bilateral political conflicts among member states. The most vital and serious problem that divide South Asia is the Indo-Pak conflict which is exacerbated by the nuclear

tests and created new areas of tension and dissonance. It is crucial that the South Asian states have a regional outlook with regard to security matters to overcome the recurrent setbacks caused by continued political differences among the member states. The need of the hour is to conjoin a pragmatic move towards the idea of regional energy cooperation and the best can be achieved under the SAARC umbrella. Above all the coherence and resonance in the region will boost the individual potency of SAARC member states as well as that of the South Asian region as a whole in the strive towards regional energy cooperation. In fact SAARC is getting more relevance in the 21st century by the worldwide as well as regional efforts in mitigating climate change, energy cooperation and expansion of renewable energy sources, avert terrorism, combating pandemics and so on. In short, South Asian Countries stand at the nub of all potential opportunities and must be at the cutting edge by taking the guidance to reap the great benefits from regional energy cooperation.

Cross Border energy Trade opens plethora of opportunities for all the member states of South Asia in terms of socio-economic and political benefits. In the era of new security challenges particularly climate change and energy

security, CBET deserves special attention because in the larger South Asian context intense utilization of renewable energy sources and its cross border energy trade at the bilateral, multilateral and regional trade not only reduce emissions but also ensure energy security within the region. Today, India is in need of a stable and strong internal energy market to satisfy the vast majority of its population and its economic development. In consideration of its splendid renewable energy sources, India has the opportunity to create an internal renewable energy market by connecting zonal energy hubs with the local availability of resources across the country. The existing, ongoing and proposed CBET will enable India in the accomplishment of its internal energy market initiatives. Internal energy markets and renewable energy production will satisfy individual domestic demands in addition to the energy needs of the South Asian region. Thus the cooperation in the energy sector will spill over to other sectors of cooperation and lead to further development of accompanied sectors that will prop up the development aspirations of the entire region itself.

References

1. ESCAP (2018). Integrating South Asia's Power Grid for a Sustainable and Low Carbon Future, The Economic and Social Commission for Asia and the Pacific, Bangkok.
2. Gippner, O. (2010). Energy Cooperation in South Asia: Prospects and Challenges, Kathmandu: South Asia Watch on Trade, Economics and Environment.
3. Jamil, S., Ahmad, A.A., Rizvi, S.Z.A. and Gwadabe, N.M. (2020). "An Analysis of Regional Security Dynamics of South Asia in Post 9/11 Period", International Journal of Scientific & Technology Research, 9(01): 3733-3739.
4. Muzaffar, M., Jathol, I. and Yaseen, Z. (2017). "SAARC: An Evaluation of its Achievements, Failures, and Compulsion for Cooperation", Global Political Review, II (I): 36-45.
5. Nag, T. (2019). Barriers to Cross-border Energy Cooperation and Implications on Energy Security: An Indian Perspective with Reference to Energy Trade in South Asia, Global Business Review, <https://journals.sagepub.com/doi/abs/10.1177/0972150919826380>. Retrieved on 10-09-2020.
6. NEP (2017). Draft National Energy Policy, NITI Aayog, Government of India.
7. Pranti, A.S., Iqbal, M.S., Saifullah, A. Z. A. and Ahmed, M.K. (2013). "Current Energy Situation And Comparative Solar Power Possibility Analysis For Obtaining Sustainable Energy Security In South Asia", International Journal of Scientific & Technology Research, 2 (8): 1-10.

8. Rodrigo, A.S. and Fernando, D.V (2018). Techno-Economic Analysis of Intermittent Renewable Energy Penetration with the Proposed India-Sri Lanka HVDC Interconnection, *Engineer*, LI(4): 1-13.
9. Rose, A., McBennett, B., Palchak, D., Cochran, J., Wijekoon, H.M., Samarasekara, B. and Wijekoon, R. (2018). Cross Border Electricity Trade between India and Sri Lanka: Impact on Power System Operations, Technical Report, National Renewable Energy Laboratory, NREL/TP-6A20-71983, <https://www.nrel.gov/docs/fy19osti/71983.pdf>.
10. SARI (2018). Implementation of NDCs for Renewable Energy in Sri Lanka: Addressing Gaps in Policies and Regulations, South Asia Regional Initiative for Energy Integration (SARI/EI).
11. Singh, B.K. (2013). "South Asia energy security: Challenges and opportunities", *Energy Policy*, 63: 458-468.
12. Vaidya, R. A., Yadav, N., Rai, N., Neupane, S. and Mukherji, A. (2019). "Electricity trade and cooperation in the BBIN region: lessons from global experience", *International Journal of Water Resources Development*, <https://www.tandfonline.com/doi/citedby/10.1080/07900627.2019.1566056?scroll=top&needAccess=true>
13. Wijayatunga, P. and Fernando, P. N. (2013): An Overview of Energy Cooperation in South Asia, South Asia Working Paper Series, Asian Development Bank, Manila.
14. Wijayatunga, P., Chattopadhyay, D. and Fernando, P.N. (2015). Cross-Border Power Trading in South Asia: A Techno Economic Rationale, ADB South Asia Working Paper Series, Asian Development Bank, Manila.