

# Trade in Energy Services under Different Regional Agreements BCIM, BIMSTEC+1 and ASEAN+4

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**Synopsis:** Contribution of service sector in world economy is increasing over the years and it playing a major role in world trade system. Service sector under WTO member countries generally governed by General Agreement on trade in service (GATS), formed in 1995. As trade facilitation agreement (TFA) in goods under WTO come into force, India also submitted legal draft document to multilateral body for similar agreement for services also (WTO ministerial meeting in Argentina, Jan 2017)<sup>1</sup>. But in WTO, still GATS are ongoing issue under current Doha agenda for more liberalization in different service sectors specific issue through successive round of negotiation.

Energy services are one of the most important services covered under GATS. In Uruguay round processes of liberalization of energy services was very much limited written many countries but in Doha round it's still ongoing and India and different East Asian countries engaged in negotiation processes<sup>2</sup>.

Production of primary and secondary energy covered under General Agreement on Trade and Tariff (GATT) and transmission and distribution of energy services covered under GATS rule. More importantly services like construction, engineering and consulting services which intervene in energy value added chain defined as energy related service rather than energy services.<sup>3</sup>

In study we try to depict definition of energy services based on related services associated with energy through different service database namely EBOPS<sup>4</sup>, WTO service list<sup>5</sup> and different CPC<sup>6</sup> version. We try to map degree of energy service trade liberalization under three regional agreements ( BCIM<sup>7</sup>,

BIMSTEC+1<sup>8</sup>, ASEAN+4<sup>9</sup>) through constructing a Hoekman(1995)<sup>10</sup> index chart that showing existence of limitation on Market access and national treatment written this sector. So Primary objective of our study is to identify different commitments level of liberalization of energy services and perform cluster analysis based on commitment pattern.

## INTRODUCTION

Energy plays a vital and pervasive role in all national economies. It determines the quality of our lives and is one of the most important drivers of economic development. The provision of adequate, affordable and reliable energy services is essential for economic welfare, eradication of poverty, infrastructure development, growth of health services, commerce, communication and other economic activities.

While there has been a delay in the WTO-based liberalization of trade in services<sup>11</sup>, East Asian countries are in the process of establishing preferential puri-lateral free trade agreements (FTAs) with a wide coverage fit for regional community building<sup>12</sup>. This study undertakes a mapping exercise of the different FTAs in terms of trade in services, which is an important and growing mode of international economic transaction. The study focuses on the three free trade agreements covering the service sector, namely (1) the BCIM Framework Agreement on Services, (2) the BIMSTEC (3) the ASEAN+4 Free Trade Agreement.

*What is India's Interests in the Doha Round for negotiation on Services?*

<sup>1</sup> WTO ministerial agenda, [https://www.wto.org/english/thewto\\_e/minist\\_e/mc11\\_e/mc11\\_e.htm](https://www.wto.org/english/thewto_e/minist_e/mc11_e/mc11_e.htm) visited on 4/10/2017.

<sup>2</sup> [http:// Cairnsgroup.org/Pages/wto\\_negotiations.aspx](http:// Cairnsgroup.org/Pages/wto_negotiations.aspx) visited on 10/07/2017

<sup>3</sup> [https://www.wto.org/english/tratop\\_e/serv\\_e/w52.doc](https://www.wto.org/english/tratop_e/serv_e/w52.doc) visited on 09/10/2017

<sup>4</sup> Extended balance of payments services classification EBOPS classification (UNSD, Hanoi 2010) (Classifications, EBOPS, Extended Balance of Payments Services, Hanoi 2010, UNSD

<sup>5</sup> The services sectoral classification list (MTN.GNS/W/120) is a comprehensive list of services sectors and sub-sectors covered under the GATS. It was compiled by the WTO in July 1991

<sup>6</sup> Central product classification [https://unstats.un.org/unsd/cr/downloads/CPCv2.1\\_complete%28PDF%29\\_English.pdf](https://unstats.un.org/unsd/cr/downloads/CPCv2.1_complete%28PDF%29_English.pdf)

<sup>7</sup> The Bangladesh-China-India-Myanmar Forum for Regional Cooperation (BCIM) is a sub-regional agreement in south east Asia.

<sup>8</sup> The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) is an international regional agreement involving a group of countries in South Asia and South East Asia. These are: Bangladesh, India, Myanmar, Sri Lanka, Thailand, Bhutan and Nepal and Japan.

<sup>9</sup> The Association of Southeast Asian Nations or ASEAN formed by the members countries, namely Indonesia, Malaysia, Philippines, Singapore and Thailand, Brunei Darussalam, Viet Nam, Lao PDR and Myanmar, Cambodia and other countries India, Japan, China, Korea form ASEAN+4.

<sup>10</sup> Hoekman, B. 1995. "Assessing the General Agreement on Trade in Services." World Bank Discussion Paper No. 307, World Bank, Washington D.C.

<sup>11</sup> Hoekman, Martin and Matto (2009) Address this issue.

<sup>12</sup> Fink, Molinuevo (2008), and Gootiiz and Mattoo (2009) are recent examples of study into preferential agreements covering trade in service.

- Mode 1 consider as a main driver for Indian service sector. Knowledge process outsourcings (KPO) in legal analysis, financial analysis, bio-informatics, etc. are key interest areain service value chain.
- Under mode2 India have high potentiality to offer health and education services as well as tourism service.
- Commercial presence (foreign direct investment) consists of movement of capitalin different countries economy focusing area under Mode 3 of GATS. In mode 3 Indian service sectors divide into three categories based on liberalization of services.
  - a) Sectors like software and other computer related services, telecommunications, tourism, maritime services are fully liberalized.
  - b) Sectors like banking, insurance, construction and related engineering services and health are those where the policy regime is moderately liberal with some barriers.
  - c) Sectors like accountancy, legal services, retail distribution, postal and rail transport has experienced little reform and has remained more or less closed to foreign direct investment.
- Apart from software professionals, India has comparative advantage in other professions services such as business services, engineering, construction, and Consulting, accountancy, and management services etc. which is stable source of foreign exchange inflow in country as per mode 4.

#### INDIA'S CONCERNS

It is being observed that political unrests are growing among many major players of developed countries which restrict trade with other countries through model. Therefore, any policy change and economic downturn in these countries will negatively impact the Indian outsourcing sector. Protection of uncompetitive domestic providers (on political grounds) and lack of domestic egulation are preventing India from taking full advantage of liberalization on trade in services. In mode 4 Indian professionals movement in other countries are required to appear for Economic Need Tests (ENTs<sup>13</sup>) and Labour Market Tests (LMT<sup>14</sup>), which hamper effective market access affect the ability of Indian professional to provide services abroad.

<sup>13</sup>[https://www.wto.org/english/tratop\\_e/serv\\_e/mouvement\\_persons\\_e/mouvement\\_persons\\_e.htm](https://www.wto.org/english/tratop_e/serv_e/mouvement_persons_e/mouvement_persons_e.htm) visited on 10/10/2017

<sup>14</sup>The Resident labour market test is a key component of recruitment process for Tire 2 migrant and ensuring that each RLMT is correctly conducted on top priority basis.

In short, India has an offensive interest in Mode 1 and Mode 4 under energy services. India could also commit to liberalize FDI under Mode 3 to some extent. Since India is adopting unilateral liberalization to enjoy more gains from liberalization on trade in services. WTO's General Agreement on Trade in Services (GATS) is still ongoing under the current Doha Development Agenda for further multilateral liberalization; its basic framework of negotiation is fully taken into consideration and implemented under the three FTAs in the Asia Pacific region.

#### OBJECTIVE OF STUDY

To strengthen competitive position after exercising existence of limitation on market access and national treatment on energy services and how different commitments pattern reacts in different regional trading blocks through similarities of energy services. It helps policy makers how to increase commitment level in different modes of energy services and other allied skill like service related technology transfer require to fulfill sustainable development among these region.

#### LITERATURE REVIEW

Arpita Mukherjee, Ramneet Goswami (2009), Trade in Energy Services: GATS and India, Indian council for research on International economic relation (ICRIER) examined India's opportunities and constraints to trade in energy services within the GATS framework.

Joachim Monkelbaan (2013), Trade in sustainable energy services, International Centre for Trade and Sustainable Development (ICTSD), explored 'win-win' outcomes for socioeconomic development based on sustainable energy services.

Hikari Ishido (2011), Liberalization of Trade in Services under ASEAN+n: A Mapping Exercise, ERIA Discussion Paper Series depicted degree of liberalization of trade in services under four

ASEAN+n frameworks.

L. G. Burange, Sheetal J. Chaddha, Poonam Kapoor (2009), India's Trade in Services, working paper UDE 31/3/2009 illustrates that the major growth in the exports as well as imports of services have occurred chiefly in the post liberalization period i.e. from the year 1991 to the year 2007.

Hikari Ishido (2012), Liberalization of Trade in Services under ASEAN+n FTAs: A Mapping Exercise, Journal of East Asian Economic Integration Vol. 16, No. 2 pointed out existence of limitations on market access and/or national treatment by each service sector, study focused that the commitment level differs greatly between sensitive and less sensitive sectors, and that the commitment level under the ASEAN Framework Agreement.

(AFAS) is the highest among the four FTAs studied.

Hikari Ishido (2013), Harmonization of trade in services by APEC members, IDE discussion paper No 410 suggested degree of service trade liberalization by APEC members towards achieving free trade area in Asia Pacific (FTAAP) and make some comparative analysis.

Huong Thanh VU (2015), assessing the integration of Vietnam's distribution services in AEC, ICIRD examined Vietnam's commitments on the distribution sector in the framework of AEC 2015 and uses indexation method to quantify and assess the commitment level of Vietnam in the field of distribution services.

Lambert Botha (2009), How do the current WTO disciplines apply to the trade of energy goods and services?, USAID Southern Africa Global Competitiveness Hub discussed within the context of WTO regulation of cross border trade in energy goods and services. It will consider a selected number of aspects within WTO agreements of relevance to the energy sector.

Ajitava Raychaudhuri, Prabir De (2007), Assessing Barriers to Trade in Education Services in Developing Asia - Pacific Countries: An Empirical Exercise, Asia-Pacific Research and Training Network on Trade Working Paper Series, No. 34 highlighted the issues surrounding the trade in education services and country specific barriers which influencing movement of students across border.

Cosimo Beverelli, Matteo Fiorini, Bernard Hoekman (2008), Services Trade Restrictiveness and Manufacturing Productivity: The Role of Institutions, Economic Research Division, and World Trade Organization focused on effect of services trade restrictiveness on manufacturing productivity for a broad cross-section of countries at different stages of economic development.

Wolfmayr, Y (2008), Trade Barriers in Services and Competitive Strengths in the Austrian Service Sector-An Analysis at the Detailed Sector Level, FIW Research Report examined a thorough and detailed analysis of the competitiveness of the Austrian service sectors.

Ingo Borchert, Batshur Gootiiz, Aaditya Mattoo (2012), Policy Barriers to International Trade in Services, Policy Research Working Paper of World Bank described a new initiative to collect comparable information on services trade policies for 103 countries, across a range of service sectors and the relevant modes of service delivery.

## METHODOLOGY

The following methodologies have been adopted in this study

- a) For defining the scope of energy services and to prepare the list of energy and related services associated with it, published literature on Arpita

Mukherjee, Ramneet Goswami this topic has been used.

- b) And to understand major four economics trade potential in these energy services and to suggest appropriate strategy,
  - Evaluate different countries export and import position based on energy services trade over period of 2009 to 2013.
  - Finding out of Revealed competitive advantage (RCA<sup>15</sup>) of four major economics and calculate average growth rate (AGR) during that period.
- c) For evaluating commitment pattern and service trade liberalization under three sub regional agreements
  - Methods of indexing based on commitments level of individual member countries for service trade for liberalization from commitment table in WTO.
  - Find out correlation among different members of that regions under each regional agreement based on indexing value.
  - Perform indexing based on commitments level based on country and mode in service trade.
  - Prepare cluster analysis based on different commitment pattern.
- d) Find out possible barriers in energy trade services.
- e) Finding out policy formulations for sustainable growth of energy services among different regions.

## .STRUCTURE OF THE PAPER

The paper is divided into four sections.

Section 1 defines the energy services and identifies major services associated with energy sector.

Section 2 analyzes five years' (2009-13) export and import trends of the energy services of major economy like India, Japan, China and Korea. Calculate RCA values based on energy services among four countries and find out average growth rate of energy services based on RCA values during 2009 to 2013.

Section 3 addresses the method of indexing service trade liberalization based upon database constructed and present correlation among the participating countries. We also evaluate indexation of commitments by country, mode and aspect of different participating countries.

In section 4 makes a cluster analysis of the commitment pattern and quantify barriers in service trade.

In section 5 we try to highlight policy recommendation.

<sup>15</sup>Annexure 1

## HYPOTHESIS

There will be sustainable gain for India and other member countries of BCM, BIMSTEC+1 and ASEAN+4 through forming free trade on energy services by liberalization of energy services issues.

### SECTION 1

#### *Energy Services Definition*

During the Uruguay Round (1986-94), it was decided in WTO that production of primary and secondary energy will be covered under head of General Agreement on Tariffs and Trade (GATT), and transmission and distribution of energy services will be subject to General Agreement on trade in services (GATS) rules. WTO member countries used a list of services (MTN.GNS/W/120) from the United Nations Provisional Central Product Classification (UNCPC) database for the purpose of negotiations in energy service trade.

In WTO Services Sectoral Classification List "W/120" covered mainly 12 service sectors distributed over 150 sub-sectors. However, it does not have a separate comprehensive category for energy services. Important energy services like transport, distribution, construction, consulting, engineering, etc. are covered by the respective horizontal categories, while some energy-related services are listed as separate sub-sectors<sup>16</sup>. For instance, services incidental to mining and services incidental to energy distribution are classified under 'Other Business Services', and pipeline transportation is covered under 'Transport services'. One of the reasons for the poor coverage of energy services in the W/120 is that the UNCPC, from which it is drawn, also does not list energy services as a separate category. However, under each broad category, there is a corresponding CPC number for energy services. For instance, CPC 632 relates to non-food retailing services under which CPC 63297 covers retail sales of fuel oil, bottled gas, coal and wood. Given the complexities of classification, countries have to be careful in scheduling commitments. It is also important to note that after the Uruguay Round, the coverage of energy services in the UNCPC has undergone changes in line with developments in this sector.

International trade in services is classified as per the fifth edition of the balance of payments manual (BPM5). The standard components of the BPM5 correspond to the four modes of services as described in the GATS framework. The BPM5 classification of IMF comprises 11 categories of services. These categories are further disaggregated at various levels and this is referred to as the extended balance of payments classification (EBOPS).

<sup>16</sup>[https://www.wto.org/english/tratop\\_e/serv\\_e/w52.doc](https://www.wto.org/english/tratop_e/serv_e/w52.doc) visited on 10/10/2017

Given the evolutionary nature of this sector and its inadequate coverage in the W/120, classification of this sector has been widely debated since the beginning of the Doha Round. The debate largely centered around two issues: (a) whether energy services should be classified as one sector or should different parts of it be classified under relevant sectors (transport, distribution, etc.), and (b) what constitutes a comprehensive coverage of this sector.

Energy services may be traded through Modes 1 (cross-border trade), 3 (foreign commercial presence) and 4 (movement of natural persons). Mode 1 also covers services related to the cross-border transmission of electricity and gas through pipelines and interconnected grids. Mode 3 is important since it covers all different forms of foreign commercial presence through FDI in BOT (build, operate and transfer) and IPP (Independent power producer). Movement of skilled professionals who deliver technical, consulting and managerial services as well as the movement of semi-skilled and unskilled personnel for preparation of distribution and transmission network specially grid under Mode 4.

Based on guideline of Mukherjee and Goswami (2009) we prepare energy service list<sup>17</sup> with help of different service related database EBOPS, W/120 and different version of CPC etc. here energy service incorporate different interlinked energy services like transport, distribution, construction, consulting, engineering, distribution and transport services.

### SECTION 2

#### *Total trade of energy services of India: -*

In this section we have examined the India's export of services related to energy sector over 2009 to 2013. The list of services based on EBOPS code and its export values over the years to world are identified in Table 1. From the data it has been observed that India's energy service export has positive trend over the years corresponding to all service code relates to energy. Simultaneously we observe India's import value of services from world. From table 2 it observed that an increasing trend in import in all service code relates to energy excerpt service code 280. From table 3 it observed that India's total service trade value fluctuate with world over the years in different energy relates service code.

#### *Total trade of energy services of China: -*

Here we have examined the China's export of services relate to energy sector over 2009 to 2013. The list of services based on EBOPS and its export values to world over the years are identified in Table 4. From the dataset it has been observed that China's energy service export to world has positive trend corresponding to all service related energy code. Simultaneously we observe China's import value of services from world also. From table 5 it observed that increasing trend

<sup>17</sup>Annexure 2

restricted to only three services relates to energy. From table 6 it observed that China's total service trade value fluctuate with world in four energy services only.

*Total trade of energy services of Japan: -*

We examined the Japan's export of energyservices over 2009 to 2013. The list of services and its export values over the years to world are identified in Table 7. From the data it has been observed that in three energy services Japan's export value has fluctuated over the years. Similarly we observe Japan's import value of services from world. From tale 8 it observed that in two energy services, 273 and 279 Japan have importing increasing and in service code 249 it has negative trend. From table 9 it observed that Japan's total service trade value fluctuate with world over the years in different energy services except 273.

*Total trade of energy services of Korea: -*

We also examined the Korea's export of energy services to world over 2009 to 2013. The list of services and its export values over the years to world are identified in Table 10 has been used for our analysis. From the data it has been observed that Korea's energy service export has fluctuated over the years corresponding to all energy services. Simultaneously we observe Korea's import value of energy services from table 11. Fluctuating trend is observed in all energy services over the years. From table 12 it observed that Korea's total service trade value fluctuate in different energy relates service code.

*Observation based on RCA values of the different energy service of India, Japan, China and Korea:-*

RCA values of Indian energy services have been calculated for the year 2009 and 2013 and average growth rate have been generated for evaluation purposes. From table 13 we observed that India have competitive advantage in different energy services based on EBOPS code 280, 274, 277, 273 and 271. India has not competitive advantage in service sector codes like 279, 249 and 279. From growth rate value we examined highest growth rate prevailed in service code 283 followed by service code 273.

RCA values of China energy services have been calculated for the year 2009 and 2013 and average growth rate have been generated. From table 14 we observed that China have competitive advantage in different energy related services like 274, 277, 273 and 249. From growth rate value we examined highest growth rate prevailed in service code 273 followed by service code 274.

RCA values of Japan energy sector services have been calculated for the year 2009 and 2013 and average growth rate have been generated. From table 15 we observed that Japan have competitive advantage in different energy related service sector codes like 249, 273 and 279. From growth rate value we examined highest growth rate prevailed in service code 273 only.

RCA values of Koreaenergy services have been calculated for the year 2009 and 2013 and average growth rate have been generated. From table 16 we observed that Korea have competitive advantage in different energy services like 249, 273 and 280. Korea has not competitive advantage in service sector codes like 274, 277 and 279. From growth rate value we examined highest growth rate prevailed in service code 280 only.

### SECTION 3

*Hoekman Index*

Indexation of energy service by service trade liberalization is a new research area. Trade in energy services has long been considered as non-tradable but currently it is tradable and also because the modalities of trade in services differs greatly across different sub-sectors<sup>18</sup>. In a commitment table under GATS, four Modes<sup>19</sup> i.e. Mode 1 up to Mode 4, and two aspects of liberalization, i.e. market access (MA) and national treatment (NT), are listed in tabular formats. In each service sector, the four modes and two aspects of liberalization make eight "cells", for each of which the existence of limitations is indicated in WTO country specific commitment level in service sector. Such indication is created by filling in one of the following three indications: (1) "none" (in the case of no limitation), or (2) "unbound" (in the case where there is no legally binding commitment made), or (3) description of the limitation.

Hoekman (1995) proposes an indexation method on service sector for measuring the degree of commitments level based on GATS under three regional blocks. This method assigns values to each of 8 cells (4 modes and 2 aspects--market access (MA) and national treatment (NT)--), as follows: first assign the value 1 when the sector at issue is "fully liberalized"; 0.5 when "limited" (but bound); 0 when "unbound" (government has not committed to liberalize) by sub-sector, by mode and by aspect (market access of national treatment), and take the simple average for aggregation; then calculate the average value by services sector and by country.

The higher the figure, the more liberal the country's service trade commitments and low figure indicate low liberal in host country service trade commitment level to other members. Here we calculate index value based on the services which relates to energy sector as per service list of WTO (MTN.GNS/W/120). Index value of china is more than India indicates that china's level of commitment in energy service sector are higher.

<sup>18</sup>Rudolf Adlung and Martín Molinuevo (2008), Bilateralism in Services Trade, SWISS national center of competence in research; <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.590.6470&rep=rep1&type=pdf>

<sup>19</sup> Mode 1 refers to cross-border service provision; Mode 2, consumption abroad; Mode 3, service provision through establishing commercial presence; and Mode 4, service provision through movement of people (as suppliers).

From table 17 we evaluate commitment level among BCIM member countries in energy services. In services like 1A (engineering and integrated engineering services) and 1C (research and development service) India has highest commitment than BCIM average commitment. In other services namely 3B (long distance pipeline and power line), 3E (service related construction relate to engineering work), 4A (commission agent servicefee or contract basis of fuels, metals, ores, timber, building materials and industrial and technical chemicals), 4B (Wholesale trade services of solid, liquid and gaseous fuels and related products) and 4C (Retail sales of fuel oil, bottled gas, coal) china have highest commitment level than BCIM average commitment. Bangladesh and Myanmar have no commitment level so there value will zero in all energy related service code. If we compare country wise commitment level after incorporating all energy services we observed china has highest commitment level than India.

From table 18 we again evaluate commitment level among BIMSTEC+1 member countries in energy services. Among all services in 1A (engineering and integrated engineering services) both India and Thailand have highest commitment level, and in 1C (research and development service) India have highest commitment level. But in 1F (technical testing and scientific & technical consulting service) both Japan and Thailand have highest commitment level. Other services like 3B, (long distance pipeline and power line), 3E (service related construction relate to engineering work) and 4A (commission agent servicefee or contract basis of fuels, metals, ores, timber, building materials and industrial and technical chemicals) both Japan and Thailand have highest commitment level and in 4C (Retail sales of fuel oil, bottled gas, coal) Japan has highest commitment level than BIMSTEC+1 average commitment level. Bangladesh, Bhutan, Sri Lanka and Myanmar have no commitment level in energy related service so there value will zero. If we compare country wise commitment level after incorporating all energy services we observed Japan commitment level is highest followed by Thailand and India.

From table 19 we evaluate commitment level among ASEAN+4 member countries in energy services. In service code 1A (engineering and integrated engineering services) India, Cambodia, Malaysia, Singapore, Vietnam have highest commitment but in services 1C (research and development service) India and Singapore have highest commitment level and in 1F (technical testing and scientific & technical consulting service) Cambodia, Malaysia, Vietnam, Thailand, Japan and Korea have highest commitment level. But other services like 3B (long distance pipeline and power line), 3E (service related construction relate to engineering work) and 4A (commission agent servicefee or contract basis of fuels, metals, ores, timber, building materials and industrial and technical chemicals) Cambodia, Indonesia, Vietnam, Thailand, Japan, China and Korea have highest commitment

level and in 4B (Wholesale trade services of solid, liquid and gaseous fuels and related products) Cambodia, Japan, China and Korea have highest commitment level. In energy services 4C (Retail sales of fuel oil, bottled gas, coal) Cambodia, Japan, China and Korea have highest commitment level and in 11G (transportation of petroleum and gas services) only Cambodia has highest commitment level than ASEAN+4 average commitment level. Myanmar, Philippines, Brunei have no commitment level in energy related service so there value will zero. If we compare country wise commitment level after incorporating all energy services we observed Cambodia has highest commitment level followed by Korea and Japan.

#### *Correlation of commitments among the participating countries based on energy service:*

After calculating the Hoekman index, we evaluate similarities pattern among BCIM and other member countries by measuring correlation coefficient among them. This has been done by comparing the calculated Hoekman Indices by country and based energy services. The results are presented in the following table.

From table 19 we examined correlation among BCIM countries based on energy services. Correlation between India and BCIM is very week but in case of China and BCIM are positive<sup>20</sup> indicating there is some commonality among the participating countries with the commitment pattern. But in case of India and China have negative correlation indicating no similarities in commitment pattern in energy services. It is one of the notable and valuable observations from our research.

From table 20 we examined correlation among BIMSTEC+1 member countries. Correlation between India and BIMSTEC+1 is very week but in case of Japan, Thailand and Nepal Vis a vi BIMSTEC+1 are positive indicating there is some commonality among the participating countries with the commitment pattern. Correlation between India vs. Japan and India vs. Nepal are weekly positive indicating very small similarities in commitment pattern of energy services.

From table 21 we also examined correlation among ASEAN+4 member countries. Correlation between India and ASEAN+4 is very low but in case of Indonesia, Malaysia, Vietnam, Thailand, Japan, China and Korea Vis a vi ASEAN+4 are positive indicating there is some commonality among the participating countries with the commitment pattern. Correlation between India vs. Japan and India vs.

<sup>20</sup>The correlation value between 0.3 and 0.7 generally indicate a weak positive correlation, and if the value is less than 0.3, it is usually judged that there is no correlation. In view of this, if the correlation is between 0.3 and 0.7, there is some commonality among the participating countries with the commitment pattern. And if the correlation is less than 0.3, then each of the countries has its own "unique commitment pattern" determined mainly by its unique domestic sensitivities.

Malaysia and India vs. Singapore are weekly positive indicating small similarities in commitment pattern of energy services.

#### *Hoekman Index by country, by mode and by aspect:*

The Hoekman Index has also been calculated by country, by aspect. If we observed commitment pattern based mode we see that while mode 1 and mode 3 exhibit energy service based variation while in mode 2 has deepest commitment and in mode 4 shows least commitment across all countries commitment pattern among energy services. Table 22 shows Hoekman index by different mode among BCIM member countries based on two aspects Market Access (MA) and National Treatment (NT). Table 23 shows Hoekman index by different mode among BIMSTEC+1 member countries based on two aspects Market Access (MA) and National Treatment (NT) and Table 24 shows Hoekman index by different mode among ASEAN+4 member countries based on two aspects Market Access (MA) and National Treatment (NT).

#### *Cluster Analysis*

The next attempt is to highlight similarities in commitments among individual participating members of BCIM countries based on clustering method. The standard k means clustering method<sup>21</sup> has been applied to the calculated Hoekman Index on energy services. Figure 1 shows the clustering of energy services in the form of a “dendrogram” (tree-shaped categorization). Table 25 shows no of clustered formation and services attached to each cluster. In BCIM regions two clusters are formed and five services attached to first cluster and four services attached to second cluster. Table 26 gives information regarding each energy services belongs to which cluster based on distance value. Cluster 1 consists of energy related service codes 1A(engineering and integrated engineering services), 3B(long distance pipeline and power line), 3E(service related construction relate to engineering work), 4A(commission agent servicefee or contract basis of fuels, metals, ores, timber, building materials and industrial and technical chemicals), and 4BWholesale trade services of solid, liquid and gaseous fuels and related products) and cluster 2 consists of 1C(research and development service), 1F(technical testing and scientific & technical consulting service), 4C(Retail sales of fuel oil, bottled gas, coal) and 11G (transportation of petroleum and gas) among BCIM member countries. Table 27 gives ANOVA table for judgment of significance level in clustering method.

We again highlighting similarities in commitments pattern among individual participating members of BIMSTEC+1 member countries. Figure 2 shows the clustering of energy services in the form of a “dendrogram” (tree-shaped

categorization). Table 28 shows no of clustered formation and services attached to each cluster. Here two clusters are formed and seven services attached to first cluster and two services attached to second cluster. Table 29 gives information regarding each energy services belongs to which cluster based on distance value. Cluster 1 consists of energy related service codes 1A(engineering and integrated engineering services), 1F(technical testing and scientific & technical consulting service), 3B(long distance pipeline and power line), 3E(service related construction relate to engineering work), 4A(commission agent servicefee or contract basis of fuels, metals, ores, timber, building materials and industrial and technical chemicals) , 4C (Retail sales of fuel oil, bottled gas, coal) and 4B(Wholesale trade services of solid, liquid and gaseous fuels and related products) and cluster 2 consists of 1C (research and development service) and 11G (transportation of petroleum and gas) among BIMSTEC+1 member countries. Table 30 gives ANOVA table for judgment of level of significance in clustering.

We also highlight similarities in commitments pattern among individual participating members of ASEAN+4 member countries. Figure 3 shows the clustering of energy services in the form of a “dendrogram” (tree-shaped categorization). Table 31 shows no of clustered formation and services attached to each cluster. Here two clusters are formed and five services attached to first cluster and four services attached to second cluster. Table 32 gives information regarding each energy services belongs to which cluster based on distance value. Cluster 1 consists of energy related service codes 1A(engineering and integrated engineering services), 1F(technical testing and scientific & technical consulting service), 3B(long distance pipeline and power line), 3E(service related construction relate to engineering work and 4A(commission agent servicefee or contract basis of fuels, metals, ores, timber, building materials and industrial and technical chemicals) and cluster 2 consists of 1C(research and development service), 4B(Wholesale trade services of solid, liquid and gaseous fuels and related products), 4C(Retail sales of fuel oil, bottled gas, coal) and 11G (transportation of petroleum and gas) among ASEAN+4 member countries. Table 33 gives ANOVA table for judgment of level of significance in clustering.

#### *Services Trade Restrictiveness Index (STRI)*

Service trade restrictiveness index is a unique and evidence based diagnostic tool that provide up to date information in service trade barriers in global trade services<sup>22</sup>. It gives information to policymaker to scope out reform option, benchmark them relative to global best practices and compile trade policy for trade negotiation of business. In this paper reviews the main contributions to the “direct approach” used

<sup>21</sup>Cluster analysis is a method of grouping observations into subgroups (called clusters) so that observations in the same cluster are similar in terms of “distance”, which is Euclidean distance.

<sup>22</sup><http://www.oecd.org/tad/services-trade/services-trade-restrictiveness-index.htm> visited on 11/10/2017

to quantify barriers to trade in services, and apply a number of methodological enhancements suggested by the ongoing OECD Services Trade Restrictiveness Index (STRI) database.

International trade in services is often impeded by trade and investment barriers and domestic regulation. STRI helps to identify which policy measure restrict trade. STRI takes values from 0 to 1, where 0 indicates completely open and 1 indicates completely closed for negotiation in service trade policy. It provides policy makers and negotiators with information and measurement tool to open up international service trade in service and negotiate international service trade agreement. Here we examined restrictiveness value among four major economies (India, Japan, China and Korea) in terms of energy service trade pillars like architectural, engineering, construction and distribution services. From table we observed that all major economies has put index value in aforesaid service categories less than 1 indicates there is enough scope of further negotiation in energy services to bust up service trade among three major FTAs.

#### STRI of India, China, Japan and Korea on 2016

Country	Architecture	Engineering	Distribution	Construction
China	.248	.245	.271	.313
India	.630	.272	.406	.309
Japan	.153	.153	.116	.101
Korea	.173	.137	.089	.111

Source: <https://stats.oecd.org/Index.aspx?DataSetCode=STRI>

#### CONCLUSION

This study focuses on mapping the degree of liberalization on trade in services among three major FTAs. We also investigate causal links between restrictions on trade in services and the actual performances of service trade. A distinction can be drawn between actual policy provisions and the noted commitments by individual member country among regions in energy related services. In addition, enforcement of the bound commitments is quite another diplomatic issue in energy service trade; deeply committed one country may be want to form of an FTA, but in reality such commitment might not be actually realized. The indexing exercise in this study has overall revealed that the commitment level under the different FTAs and evaluate India's position in energy services among regions.

Cross-country similarities are judging properly in service sector commitment under each of the FTAs. This implies that the shared domestic sensitivities can be overcome by a shared economic cooperation scheme for enhancing competitiveness.

We also analyzed from different countries commitment pattern and observed Mode 4 (movement of people) is least committed, whereas Mode 2 (consumption abroad) is most committed under all the three FTAs.

Lastly one interesting observation that all major players namely India, China, Japan and Korea among three regional agreements have put service trade restrictiveness index value in low level so that there is enough scope of further negotiation in energy services to bust up service trade among the regions.

#### BIBLIOGRAPHY

- [1]. Arpita Mukherjee, Ramneet Goswami (2009), Trade in Energy Services: GATS and India, Indian council for research on International economic relation (ICRIER)
- [2]. Joachim Monkelbaan (2013), Trade in sustainable energy services, International Centre for Trade and Sustainable Development (ICTSD).
- [3]. Hikari Ishido (2011), Liberalization of Trade in Services under ASEAN+n: A Mapping Exercise, ERIA Discussion Paper Series.
- [4]. Hikari Ishido (2013), Harmonization of trade in services by APEC members, IDE discussion paper No 410.
- [5]. Huong Thanh VU (2015), assessing the integration of Vietnam's distribution services in AEC, ICIRD.
- [6]. Lambert Botha (2009), How do the current WTO disciplines apply to the trade of energy goods and services?, USAID Southern Africa Global Competitiveness Hub.
- [7]. Ajitava Raychaudhuri, Prabir De (2007), Assessing Barriers to Trade in Education Services in Developing Asia - Pacific Countries: An Empirical Exercise, Asia-Pacific Research and Training Network on Trade Working Paper Series, No. 34.
- [8]. Cosimo Beverelli, Matteo Fiorini, Bernard Hoekman (2008), Services Trade Restrictiveness and Manufacturing Productivity: The Role of Institutions, Economic Research Division, and World Trade Organization.
- [9]. Wolfmayr, Y (2008), Trade Barriers in Services and Competitive Strengths in the Austrian Service Sector - An Analysis at the Detailed Sector Level, FIW Research Report.
- [10]. Ingo Borchert, Batshur Gootiiz, Aaditya Mattoo (2012), Policy Barriers to International Trade in Services, Policy Research Working Paper of World Bank.
- [11]. Hoekman, B. 1995. "Assessing the General Agreement on Trade in Services." World Bank Discussion Paper No. 307, World Bank, Washington D.C.
- [12]. [http://cairngroup.org/Pages/wto\\_negotiations.aspx](http://cairngroup.org/Pages/wto_negotiations.aspx) visited on 10/07/2017
- [13]. [https://www.wto.org/english/tratop\\_e/serve\\_e/w52.doc](https://www.wto.org/english/tratop_e/serve_e/w52.doc) visited on 10/10/2017
- [14]. Karmakar, Suparna (2005). "India-ASEAN Cooperation in Services - An Overview", *Indian Council for Research on International Economic Relations (ICRIER), Working Paper No. 176*, New Delhi.
- [15]. <https://stats.oecd.org/Index.aspx?DataSetCode=STRI> visited on 15/10/2017
- [16]. Hoekman, B., W. Martin and A. Mattoo. 2009. "Conclude Doha: It Matters!" World Bank Policy Research Working Paper 5135, World Bank, Washington D.C.
- [17]. Fink, C. and M. Molinuevo. 2008. "East Asian Preferential Trade Agreements in Services: Liberalization Content and WTO Rules." *World Trade Review*, Vol. 7, (issue no. 4), pp. 641-673.
- [18]. Gootiiz, B. and A. Mattoo. 2009. "Services in Doha: What's on the Table?" Policy Research Working Paper, WPS4903 <http://documents.worldbank.org/curated/en/707781468337263912/pdf/WPS4903.pdf>
- [19]. [https://unstats.un.org/unsd/cr/downloads/CPCv2.1\\_complete%28PDF%29\\_English.pdf](https://unstats.un.org/unsd/cr/downloads/CPCv2.1_complete%28PDF%29_English.pdf) visited on 10/12/2016
- [20]. OECD (2009) "Testing the Services Trade Restrictiveness Index: Gravity Regressions and Trade Costs Analysis." a paper presented at OECD Experts Meeting on the Services Trade Restrictiveness Index (STRI), Paris, 2-3 July 2009.



http://www.oecd.org/document/9/0,3343,en\_2649\_36344374\_415\_24105\_1\_1\_1\_37431,0\_0.html, (accessed 14 January 2011).

[21]. ASEAN (2004), *ASEAN Plan of Action for Energy Cooperation (APAEC) 2004-2009*, July 2004, Philippines, <http://www.aseansec.org/pdf/APAEC0409.pdf>

[22]. United Nations (2008). "UN Service Trade Database", Retrieved on 14-08-08 from <http://unstats.un.org/unsd/servicetrade/default.aspx>

[23]. Hiong, T. T. 2011. ASEAN Integration in Trade in Services: Development, Challenges, and Way Forward. ADBI-PECC Conference on Strategies to Enhance Competitiveness and Facilitate Regional Trade and Investment in Services, Hong Kong, China, 1-3 June.

[24]. WTO ministerial agenda, [https://www.wto.org/english/thewto\\_e/minist\\_e/mc11\\_e/mc11\\_e.htm](https://www.wto.org/english/thewto_e/minist_e/mc11_e/mc11_e.htm) visited on 04/10/2017

[25]. [https://www.wto.org/english/tratop\\_e/serv\\_e/mouvement\\_persons\\_e/mouvement\\_persons\\_e.htm](https://www.wto.org/english/tratop_e/serv_e/mouvement_persons_e/mouvement_persons_e.htm) visited on 10/10/2017

[26]. Rudolf Adlung and Martín Molinuevo (2008), Bilateralism in Services Trade, SWISS national center of competence in research; <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.590.6470&rep=rep1&type=pdf>

**List of tables:**

**Table1: Export of services relates to energy sector by India to world among five consecutive years (2009-13) in \$**

Country	Service Code	Export Value in 2009	Export Value in 2010	Export Value in 2011	Export Value in 2012	Export Value in 2013
India	249	837000000	525000000	838000000	922330350	1219106920
India	271	1489000000	4831000000	3357000000	3546810800	2614491740
India	273	9495000000	15100000000	19407736830	24652360950	25352951500
India	274	4623000000	8590000000	9982281080	12011488730	12118970900
India	277	3789000000	7870000000	8985326970	10718556320	10599073120
India	279	613000000	900000000	752455750	953224660	1019074900
India	280	1412000000	1971000000	2629000000	2635490490	3021062440
India	281	256000000	343000000	217000000	151276360	188978130
India	283	154000000	276000000	145000000	62598750	137658080
India	287	467000000	335000000	345700570	766654380	1232339970

EBOPS service categories used for calculation

**Table2: Import of services relates to energy sector by India from world among five consecutive years (2009-13) in \$**

Country	Service Code	Import value in 2009	Import Value in 2010	Import Value in 2011	Import Value in 2012	Import Value in 2013
India	249	1079000000	991000000	1132000000	1094383443	1393944968
India	271	1726000000	1842000000	2049000000	3465175687	3012896830
India	273	13743000000	22470000000	27167797933	30840741990	30836464711
India	274	5509000000	9897000000	10669000000	9314568087	7534491627
India	277	5112000000	9486000000	10270000000	9006963440	7205454040
India	279	262000000	319000000	218000000	258146866	258878860
India	280	3584000000	5565000000	1029000000	1530239645	1616857065
India	281	175000000	114000000	129797933	607897435	173104983
India	283	172000000	108000000	114000000	595899598	122038707

EBOPS service categories used for calculation

**Table 3: Total Trade of services relates to energy sector of India during five consecutive years (2009-13) in \$**

Reporter	Service Code	Total Trade 2009	Total Trade 2010	Total Trade 2011	Total Trade 2012	Total Trade 2013
India	249	1916000000	1516000000	1970000000	2016713793	2613051888
India	271	3215000000	6673000000	5406000000	7011986487	5627388570

India	273	2323800000	3757000000	46575534763	55493102940	56189416211
India	274	1013200000	1848700000	20651281080	21326056817	19653462527
India	277	8901000000	17356000000	19255326970	19725519760	17804527160
India	279	875000000	1219000000	970455750	1211371526	1277953760
India	280	4996000000	7536000000	3658000000	4165730135	4637919505
India	281	431000000	457000000	346797933	759173795	362083113
India	283	326000000	384000000	259000000	658498348	259696787

EBOPS service categories used for calculation

**Table 4: Export of services relates to energy sector of China to world among five consecutive years (2009-13) in \$**

Reporter	Service Code	Export Value 2009	Export Value 2010	Export Value 2011	Export Value 2012	Export Value 2013
China	249	9462791887	14494686429	14724000000	12245918921	10663035032
China	273	20935051840	25654846870	32409000000	38198001604	45441727063
China	274	18622500332	22769600894	28391000000	33447099618	40535627763
China	287	97263302	122914773	122776176	125578920	147159448
China	277				33447099618	40535627763

EBOPS service categories used for calculation

**Table 5: Import of services relates to energy sector of China to world among five consecutive years (2009-13) in \$**

Reporter	Service Code	Import Value 2009	Import Value 2010	Import Value 2011	Import Value 2012	Import Value 2013
China	249	5867637104	5071841491	3728435521	3618703858	3890273000
China	273	15363552623	17134113900	21354824409	22793128839	
China	274	13410192358	15093817631	18581543869	20019716903	

EBOPS service categories used for calculation

**Table 6: Total Trade of specific services relates to energy sector of China during five consecutive years (2009-13) in \$**

Reporter	Service Code	Total Trade 2009	Total Trade 2010	Total Trade 2011	Total Trade 2012	Total Trade 2013
China	249	15330428991	19566527920	18452435521	15864622779	14553308032
China	273	36298604463	42788960770	53763824409	60991130443	45441727063
China	274	32032692690	37863418525	46972543869	53466816521	40535627763
China	277	0	0	0	33447099618	40535627763

EBOPS service categories used for calculation

**Table 7: Export of services relates to energy sector of Japan to world among five consecutive years (2009-13) in \$**

Reporter	Service Code	Export Value 2009	Export Value 2010	Export Value 2011	Export Value 2012	Export Value 2013
Japan	249	12870225320	10733050552	10194648451	11899929841	9666500000
Japan	271					
Japan	273	15463385994	15900380476	16727575429	16883762792	
Japan	274					
Japan	277					
Japan	279	4328389304	4128339554	3922319403	4326043442	3844890000

Japan	280					
Japan	283					

EBOPS service categories used for calculation

**Table 8: Import of services relates to energy sector of Japan from world among five consecutive years (2009-13) in \$**

Reporter	Service Code	Import Value 2009	Import Value 2010	Import Value 2011	Import Value 2012	Import Value 2013
Japan	249	11825711087	7953956318	7167983449	7966084646	7501210000
Japan	271					
Japan	273	28326715162	28373699244	30725498014	36755124808	
Japan	274					
Japan	277					
Japan	279	10207263255	9919996903	9887749604	11058446867	12156480000
Japan	280				117000	14000
Japan	283					

EBOPS service categories used for calculation

**Table 9: Total Trade of services relates to energy sector of Japan to world among five consecutive years (2009-13) in \$**

Reporter	Service Code	Total Value 2009	Total Value 2010	Total Value 2011	Total Value 2012	Total Value 2013
Japan	249	24695936407	18687006870	17362631900	19866014487	17167710000
Japan	271	0	0	0	0	0
Japan	273	43790101156	44274079720	47453073443	53638887600	0
Japan	274	0	0	0	0	0
Japan	277	0	0	0	0	0
Japan	279	14535652559	14048336457	13810069007	15384490309	16001370000
Japan	280	0	0	0	117000	14000
Japan	283	0	0	0	0	0

EBOPS service categories used for calculation

**Table 10: Export of services relates to energy sector by Korea to world among five consecutive years (2009-13) in \$**

Country	Service Code	Export Value in 2009	Export Value in 2010	Export Value in 2011	Export Value in 2012	Export Value in 2013
Korea	249	14553000000	11977000000	15478400000	19708600000	20374800000
Korea	271	20390000000				
Korea	273	7076000000	11272000000	13123400000	15794500000	17041900000
Korea	274	9060000000	9950000000	11496000000	12052000000	13341000000
Korea	277	2840000000	3140000000	3658000000	3654000000	4704000000
Korea	279	5060000000	3820000000	4744000000	5008000000	6184000000
Korea	280	3690000000	4060000000	5713000000	15548000000	27837000000
Korea	283	8000000	6471000000			
Korea	284	28440000000	6471000000	7744400000	9068100000	9260400000

EBOPS service categories used for calculation

**Table11: Import of services relates to energy sector by Korea to world among five consecutive years (2009-13) in \$**

Country	Service Code	Import Value in 2009	Import Value in 2010	Import Value in 2011	Import Value in 2012	Import Value in 2013
Korea	249	2806100000	2302000000	3794700000	3363200000	4852300000
Korea	271	2214200000				
Korea	273	17355500000	22698000000	23924200000	26730800000	25986500000
Korea	274	2154800000	2027000000	2168200000	2590900000	2565500000
Korea	277	1105300000	937000000	945700000	1193800000	1047100000
Korea	279	995700000	1171000000	1854100000	2334600000	2137700000
Korea	280	643200000	638000000	873400000	1187200000	1007000000
Korea	283	20400000				
Korea	284	4908400000	11228000000	12477300000	14349500000	14063700000

EBOPS service categories used for calculation

**Table12: Total Trade of services relates to energy sector by Korea to world among five consecutive years (2009-13) in \$**

Country	Service code	Total trade in 2009	Total trade in 2010	Total trade in 2011	Total trade in 2012	Total trade in 2013
Korea	249	17359100000	14279000000	19273100000	23071800000	25227100000
Korea	271	4253200000	0	0	0	0
Korea	273	24431500000	33970000000	37047600000	42525300000	43028400000
Korea	274	3060800000	3022000000	3317800000	3796100000	3899600000
Korea	277	1389300000	1251000000	1311500000	1559200000	1517500000
Korea	279	1501700000	1553000000	2328500000	2835400000	2756100000
Korea	280	1012200000	1044000000	1444700000	2742000000	3790700000
Korea	283	28400000	6471000000	0	0	0
Korea	284	7752400000	17699000000	20221700000	23417600000	23324100000

EBOPS service categories used for calculation

**Table 13: RCA of Indian Energy Service between 2009 and 2013 and calculate average growth rate**

Service Category	RCA 2013	RCA 2009	Average Growth Rate.
280	1.2221	0.6888	77.4272
279	0.5675	0.2783	103.9505
274	1.8275	1.1477	59.2376
277	1.6202	1.6359	-0.9610
273	1.3674	0.5968	129.1188
283	5.4983	0.6816	706.6777
249	0.4283	0.2925	46.4326
271	1.2880	1.3848	-6.9946

(EBOPS service categories used for calculation)

**Table 14: RCA of China Energy Service between 2009 and 2013 and calculate average growth rate**

Service Category	RCA 2013	RCA2009	Average Growth Rate
274	4.410569	3.322001527	32.76842

277	4.470874		Value not calculated
273	1.768391	0.945536193	87.0252
249	2.702884	2.376033318	13.75615

(EBOPS service categories used for calculation)

**Table 15: RCA of Japan Energy Service between 2009 and 2013 and calculate average growth rate**

Service Code	RCA2009	RCA2013	Average Growth rate
249	3.155451539	4.196295878	0.32985591
273	0.681808643	1.439780659	1.11170784
279	1.378327456	1.841024167	0.33569433

(EBOPS service categories used for calculation)

**Table 16: RCA of Korea Energy Service between 2009 and 2013 and calculate average growth rate**

Service Code	RCA 2009	RCA 2013	Average Growth Rate
249	6.43132236	9.175257147	0.426651726
273	0.562364781	1.855873177	2.300123408
274	0.284391236	0.470950305	0.65599444
277	0.155040359	0.182750254	0.178726979
279	0.290435028	0.336032322	0.156996537
280	0.227604398	1.517998523	5.669460419

(EBOPS service categories used for calculation)

**Table 17: Calculation of Hoekman Index based on service sector commitment level relates to Energy Sector among BCIM member countries**

Country	1A	1C	1F	3B	3E	4A	4B	4C	11G	Average Hoekman Index
India	0.4688	0.1875	0.0000	0.0625	0.0000	0.0000	0.0000	0.0000	0.0000	0.0799
China	0.0000	0.0000	0.1719	0.4375	0.4375	0.4375	0.4375	0.2500	0.0000	0.2413
Myanmar	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bangladesh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BCIM Average	0.1172	0.0469	0.0430	0.1250	0.1094	0.1094	0.1094	0.0625	0.0000	

**Table 18: Calculation of Hoekman Index based on service sector commitment level relates to Energy Sector among BIMSTEC+1 member countries**

Country	1A	1C	1F	3B	3E	4A	4B	4C	11G	Average Hoekman Index
India	0.4688	0.1875	0.0000	0.0625	0.0000	0.0000	0.0000	0.0000	0.0000	0.0799
Japan	0.0000	0.0000	0.4583	0.5000	0.5000	0.7500	0.7500	0.7500	0.0000	0.4120
Myanmar	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bangladesh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Thailand	0.3437	0.0000	0.4097	0.6875	0.4375	0.5000	0.0000	0.0000	0.0000	0.2643
Nepal	0.0625	0.0625	0.0278	0.0625	0.0625	0.0625	0.0000	0.0000	0.0000	0.0378
Bhutan	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Sri Lanka	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BIMSTEC+1 Average	0.1094	0.0313	0.1120	0.1641	0.1250	0.1641	0.0938	0.0938	0.0000	0.0992

**Table 19: Calculation of Hoekman Index based on service sector commitment level relates to Energy Sector among ASEAN+4 member countries**

Country	1A	1C	1F	3B	3E	4A	4B	4C	11G	Average Hoekman Index
Brunei	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cambodia	0.7500	0.0000	0.5000	0.5000	0.5000	0.5000	0.7500	0.7500	0.6250	0.5417
Indonesia	0.0937	0.0000	0.0833	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.0752
Malaysia	0.5625	0.0000	0.3056	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0965
Myanmar	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Philippines	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Singapore	0.3438	0.7500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1215
Vietnam	0.3750	0.7500	0.5556	0.5000	0.5000	0.5000	0.0000	0.0000	0.0000	0.3534
Thailand	0.3437	0.0000	0.4097	0.6875	0.4375	0.5000	0.0000	0.0000	0.0000	0.2643
India	0.4688	0.1875	0.0000	0.0625	0.0000	0.0000	0.0000	0.0000	0.0000	0.0799
Japan	0.0000	0.0000	0.4583	0.5000	0.5000	0.7500	0.7500	0.7500	0.0000	0.4120
China	0.0000	0.0000	0.1719	0.4375	0.4375	0.4375	0.4375	0.2500	0.0000	0.2413
Korea	0.3750	0.5000	0.5486	0.5000	0.4375	0.5000	0.4375	0.4375	0.0000	0.4151
ASEAN+4 Average	0.2548	0.1683	0.2333	0.2644	0.2356	0.2452	0.1827	0.1683	0.0481	0.2001

**Table 19: Correlation coefficient based on HI value among BCIM countries**

Country	India	China	Myanmar	Bangladesh	BCIM Average
India	1				0.250047
China	-0.56372	1			0.658769
Myanmar	*	*	1		
Bangladesh	*	*	*	1	

**Table 20: Correlation based on HI value among BIMSTEC+1 country**

Country	India	Japan	Myanmar	Bangladesh	Thailand	Nepal	Bhutan	Sri Lanka	BIMSTEC+1 Average
India	1.0000								0.0570
Japan	0.6330	1.0000							0.6351
Myanmar	*	*	1.0000						*
Bangladesh	*	*	*	1.0000					*
Thailand	0.0417	0.2061	*	*	1.0000				0.8300
Nepal	0.4585	0.2251	*	*	0.6826	1.0000			0.4840
Bhutan	*	*	*	*	*	*	1.0000		*
Sri Lanka	*	*	*	*	*	*	*	1.0000	*

**Table 21: Correlation based on HI value among ASEAN+4country**

Country	Brunei	Cambodia	Indonesia	Malaysia	Myanmar	Philippines	Singapore	Vietnam	Thailand	India	Japan	China	Korea	ASEAN+4 Average
Brunei	1													
Cambodia	*	1												
Indonesia	*	-0.02413	1		*	*								
Malaysia	*	0.276557	0.07517	1	*	*								
Myanmar	*	*	*	*	1	*	*	*	*	*	*	*	*	*
Philippines	*	*	*	*	*	1	*	*	*	*	*	*	*	*
Singapore	*	-0.68355	-0.22574	0.207952	*	*	1							
Vietnam	*	-0.78331	0.385137	0.162144	*	*	0.515806	1						
Thailand	*	-0.02635	0.744583	0.206461	*	*	-0.30543	0.544088	1					
India	*	-0.0219	0.040761	0.758425	*	*	0.645579	0.261284	0.041676	1				
Japan	*	0.357467	0.03303	-0.4087	*	*	-0.653	0.24288	0.206087	-0.63299	1			
China	*	0.213032	0.402713	-0.47594	*	*	-0.61753	0.03424	0.475035	-0.56373	0.863661	1		
Korea	*	-0.30388	0.246024	0.068843	*	*	0.145347	0.591154	0.432267	0.011585	0.490506	0.457167	1	
ASEAN+4 Average	*	-0.01343	0.570423	0.372985	*	*	-0.03535	0.570769	0.789637	0.274907	0.346515	0.482657	0.803652	1

Where ‘\*’ indicated value can’t be calculated due to non availability of data

**Table22: HI value by different mode among BCIM member countries**

Country	Aspect, i.e. Market Access(MA) or National Treatment(NT)	Hoekman Index for mode1	Hoekman Index for mode2	Hoekman Index for mode3	Hoekman Index for mode4
India	MA	0.0032	0.0032	0.0116	0
	NT	0.0032	0.0032	0.0136	0
China	MA	0.0028	0.035	0.0157	0
	NT	0.0028	0.035	0.0286	0
Myanmar	MA	0	0	0	0
	NT	0	0	0	0
Bangladesh	MA	0	0	0	0
	NT	0	0	0	0
BCIM Average	MA	0.006	0.0382	0.0273	0
	NT	0.006	0.0382	0.0422	0

**Table23: HI value by different mode among BIMSTEC+1 member countries**

Country	Aspect, i.e. Market Access(MA) or National Treatment(NT)	Hoekman Index for mode1	Hoekman Index for mode2	Hoekman Index for mode3	Hoekman Index for mode4
India	MA	0.0032	0.0032	0.0116	0

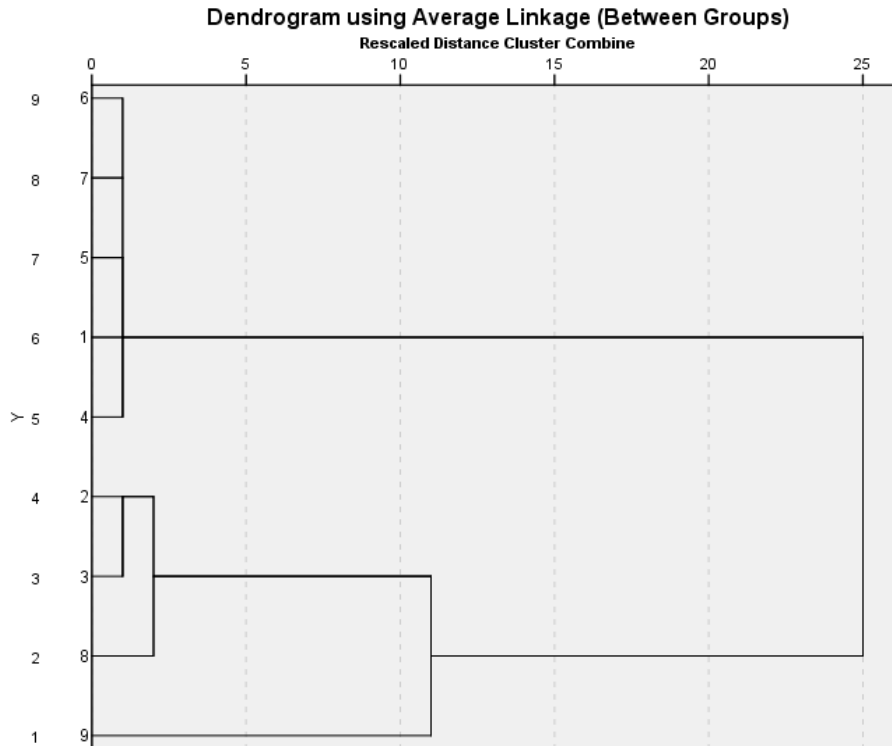
	NT	0.0032	0.0032	0.0136	0
Japan	MA	.4166	.6389	.6667	0
	NT	.3889	.6111	.6111	0
Myanmar	MA	0	0	0	0
	NT	0	0	0	0
Bangladesh	MA	0	0	0	0
	NT	0	0	0	0
Thailand	MA	.0555	.4444	.4444	.1944
	NT	.0555	.4444	.4444	.3333
Nepal	MA	0	0	0.25	0
	NT	0	0	0	0
Bhutan	MA	0	0	0	0
	NT	0	0	0	0
SriLanka	MA	0	0	0	0
	NT	0	0	0	0
BIMSTEC+1 Average	MA	.0011	.0011	.0039	.0243
	NT	.0011	.0011	.0045	.0416

**Table24: HI value by different mode among ASEAN+4 member countries**

Country	Aspect, i.e. Market Access(MA) or National Treatment(NT)	Hoekman Index for mode1	Hoekman Index for mode2	Hoekman Index for mode3	Hoekman Index for mode4
Brunei	MA	0.0000	0.0000	0.0000	0.0000
	NT	0.0000	0.0000	0.0000	0.0000
Cambodia	MA	0.5833	0.7222	0.6944	0.0000
	NT	0.6667	0.7222	0.7778	0.0000
Indonesia	MA	0.0000	0.0000	0.1389	0.0556
	NT	0.0000	0.0000	0.1389	0.1389
Malaysia	MA	0.3334	0.3334	0.1667	0.0000
	NT	0.2778	0.2778	0.3334	0.0000
Myanmar	MA	0.0000	0.0000	0.0000	0.0000
	NT	0.0000	0.0000	0.0000	0.0000
Philippines	MA	0.0000	0.0000	0.0000	0.0000
	NT	0.0000	0.0000	0.0000	0.0000
Singapore	MA	0.1112	0.1112	0.0834	0.0000
	NT	0.1112	0.1112	0.1112	0.0000
Vietnam	MA	0.4445	0.6667	0.6667	0.0000
	NT	0.5000	0.6667	0.5556	0.0000
Thailand	MA	.0555	.4444	.4444	.1944
	NT	.0555	.4444	.4444	.3333
Korea	MA	0.3334	0.4445	0.5278	0.0000
	NT	0.6111	0.7223	0.7223	0.0000
Japan	MA	.4166	.6389	.6667	0.0000



	NT	.3889	.6111	.6111	0.0000
China	MA	0.0028	0.0350	0.0157	0.0000
	NT	0.0028	0.0350	0.0286	0.0000
India	MA	0.0032	0.0032	0.0116	0.0000
	NT	0.0032	0.0032	0.0136	0.0000
ASEAN+4 Average	MA	0.1647	0.2106	0.2096	0.0051
	NT	0.1975	0.2308	0.2438	0.0126



**Table 25: No of cluster and cases attached to each cluster for energy services among BCIM member countries.**

Number of Cases in each Cluster		
Cluster	1	5.000
	2	4.000
Valid		9.000
Missing		.000

**Table 26: Information regarding each energy services for formation of cluster among BCIM member countries based on distance value.**

Cluster Membership		
Case Number	Cluster	Distance
1	1	.003
2	2	.009
3	2	.005

4	1	.011
5	1	.005
6	1	.005
7	1	.005
8	2	.024
9	2	.038

**Table 27: ANOVA for judgment of significance in clustering.**

**ANOVA**

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
BCM HI	.013	1	.000	7	38.326	.000

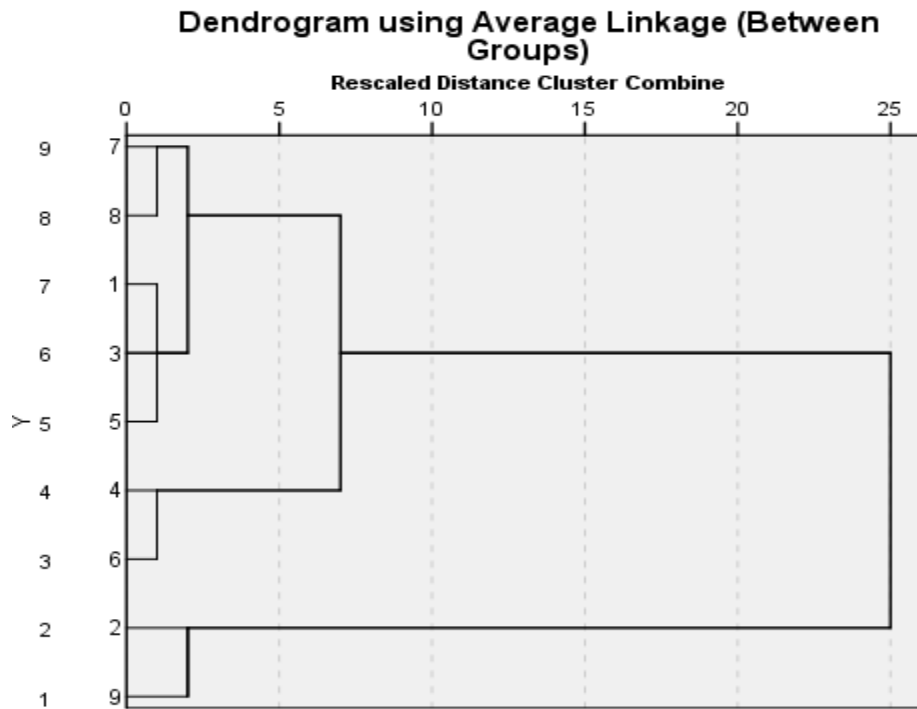


Figure 2

**Table 28: No of cluster and cases attached to each cluster for energy services among BIMSTEC+1 member countries.**

**Number of Cases in each Cluster**

Clust	1	7.000
er	2	2.000
Valid		9.000
Missing		.000

**Table 29: Information regarding each energy services for formation of cluster among BIMSTEC+1 member countries based on distance value.**

Cluster Membership		
Case Number	Cluster	Distance
1	1	.014
2	2	.016
3	1	.011
4	1	.041
5	1	.002
6	1	.041
7	1	.029
8	1	.029
9	2	.016

**Table 30: ANOVA for judgment of significance**

ANOVA

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
BIMSTEC+1 HI	.018	1	.001	7	21.397	.002

**Dendrogram using Average Linkage (Between Groups)**

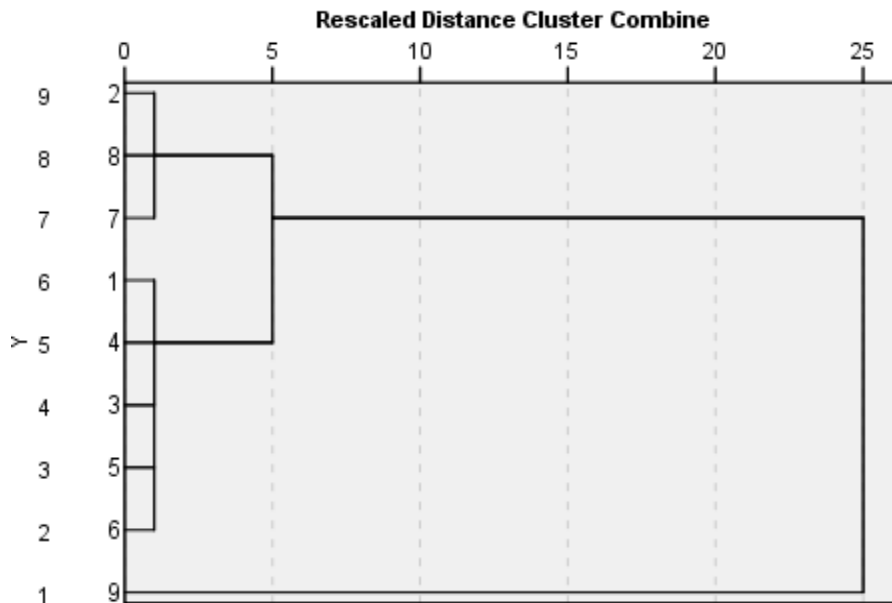


Figure3

**Table 31: Information regarding each energy services for formation of cluster among ASEAN+4 member countries based on distance value.**

Cluster Membership		
Case Number	Cluster	Distance
1	1	.008
2	2	.012
3	1	.013
4	1	.018
5	1	.011
6	1	.001
7	2	.003
8	2	.012
9	2	.020

**Table 32: ANOVA for judgment of significance**

ANOVA						
	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
ASEAN+4 HI	.010	1	.000	7	50.722	.000

**Annexure 1:**

The revealed comparative advantage index is computed as per Balassa's (1965) method. According to Balassa, comparative advantage is evaluated by the relative export performance of individual product categories. Thus,

$$RCA_{ij} = (X_{ij}/X_{wj}) / (X_i/X_w)$$

Where,

RCA<sub>ij</sub> = Revealed comparative advantage of the ith country's, jth service

x<sub>ij</sub> = Exports of the jth service by the ith country

X<sub>i</sub> = Total service exports of the ith country

x<sub>wj</sub> = World exports of the jth service

X<sub>w</sub> = Total world exports of services.

**Annexure 2:**

**Energy service list:**

EBOPS	W/120	CPC Provisional Code	Explanatory Note	CPC ver 1.0	CPC ver 2.0
280	1.A.e	Class: 8672 - Engineering services	86721 - Advisory and consultative engineering services	83331/83332/83333/83339	83310
			86722 - Engineering design services for the construction of foundations and building structures	83341	83321
			86723 - Engineering design services for mechanical and electrical installations for buildings	83341	83321
			86724 - Engineering design	83342	83323/83325/83326/83327

			services for the construction of civil engineering works		/83329
			86725 - Engineering design services for industrial processes and production	83343	83322/83324
			86726 - Engineering design services n.e.c.	83349	83323/83325/83329
			86727 - Other engineering services during the construction and installation phase	83351/83352/83353/83359	83321/83323/83325/83326/83327/83329/85322
			86729 - Other engineering services	83131/83139/83321/83322/83323/83329/83391/83392/83393/83399	83931/83939/83330/83321
	1.A.f	Class: 8673 - Integrated engineering services	86731 - Integrated engineering services for transportation infrastructure turnkey projects	83312	83329
			86732 - Integrated engineering and project management services for water supply and sanitation works turnkey projects	83312	83329
			86733 - Integrated engineering services for the construction of manufacturing turnkey projects	83313	83311/83312/83313/83319
			86739 - Integrated engineering services for other turnkey projects	83311/83312/83313/83319	83321/83323/83325/83326/83327/83329
279	1.C.a	Class: 8510 - Research and experimental development services on natural sciences and engineering	85103 - Research and experimental development services on engineering and technology	81130	81129
274	1.F.c	Class: 8650 - Management consulting services	86505 - Production management consulting services	83115	83115/83116
277	1.F.d	Class: 8660 - Services related to management consulting	86601 - Project management services other than for construction	83190	83190
273	1.F.e	Class: 8676 - Technical testing and analysis services	86763 - Testing and analysis services of integrated mechanical and electrical systems	83563	83443
			86764 - Technical inspection services	83564/83569	83444/83449
			86769 - Other technical testing and analysis services	83569	83449
283	1.F.h	Group: 883 - Services incidental to mining	88300 - Services incidental to mining	86210	67990/86211/86219
			51150 - Site preparation work for mining	54320	54320
284	1.F.j	Group: 887 - Services incidental to energy distribution	88700 - Services incidental to energy distribution	86221/86222/86223/86224	86311/86312/86320/86330/86350/86340
	1.F.j	Group: 887 - Services incidental to energy distribution	69110 - Electricity transmission and distribution services	69110	69111
	1.F.j	Group: 887 - Services incidental to energy distribution	69120 - Gas distribution services through mains	69120	69120
	1.F.m	Class: 8675 - Engineering related scientific and	86751 - Geological, geophysical and other	83510	83411

		technical consulting services	scientific prospecting services		
283	1.F.i	Class: 8845 - Manufacture of coke, refined petroleum products and nuclear fuel, on a fee or contract basis	88450 - Service related to manufacture of coke, refined petroleum products and nuclear fuel, on a fee or contract basis	86350	
284	1.F.t	Class: 8790 - Other business services	Subclass: 87909 - Other business services n.e.c.(Service incidental to mining and service incidental to energy distribution)	83990/85970/85990	83990/85961/85962
284	1.F.n	8864 - Repair services of electrical machinery and apparatus n.e.c., on a fee or contract basis	88640 - Repair services of electrical machinery and apparatus n.e.c., on a fee or contract basis	87152	87152
	1.F.n	Class: 8862 - Repair services of machinery and equipment n.e.c., on a fee or contract basis	88620 - Repair services of machinery and equipment n.e.c., on a fee or contract basis	87159	87156/87159/87157
249	3.B	Class: 5134 - For long distance pipelines, communication and power lines (cables)	51340 - For long distance pipelines, communication and power lines (cables)	54241/54242	54214/54242
	3.B	Class: 5135 - For local pipelines and cables; ancillary works	51350 - For local pipelines and cables; ancillary works	54251/54252	54214/54243
	3.B	Class: 5136 - For constructions for mining and manufacturing	51360 - For constructions for mining and manufacturing	54260	54261/54262/54269
	3.B	53242 - Construction of Long-distance communication and power lines (cables)	Construction of Long-distance communication and power lines	53242	
249	3.E	518	Renting services related to equipment for construction or demolition of buildings or civil engineering works, withoperator	54800	
271	4.A	Class: 6211 - Commission agents' services	62113 - Sales on a fee or contract basis of fuels, metals, ores, timber, building materials and industrial and technical chemicals	61261/61262/61264/61271/61272/61291/61292/61293/61296	61261/61262/61264/61271/61272/61291/61292/61293/61231
	4.B	Class: 6227 - Wholesale trade services of intermediate products, other than agricultural; wholesale trade services of waste and scrap and materials for recycling	62271 - Wholesale trade services of solid, liquid and gaseous fuels and related products	61191	61191
	4.C	Class: 6329 - Other specialized retail sales of non-food products	63297 - Retail sales of fuel oil, bottled gas, coal and wood	62191/62291/62391/62491/62591	62191/62291/62391
231	11.G.a	Class: 7131 - Transportation of petroleum and natural gas	71310 - Transportation of petroleum and natural gas	64310	
		Class: 9113 - Administrative services for more efficient operation of business	91132 - Administrative fuel and energy related services	91132	91132
			91133 - Administrative mining and mineral resources, manufacturing and construction related services	91133	91133