‘ENERGY POVERTY’ IN INDIA AND BRAZIL: IMPLICATIONS FOR ENERGY SECURITY, 2006-2015

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DECLARATION

I declare that the thesis entitled "**'Energy Poverty' in India and Brazil: Implications for Energy Security, 2006-2015**" submitted by me for the award of the degree of **Doctor of Philosophy** of Jawaharlal Nehru University is my own work. The thesis has not been submitted for any other degree of this University or any other university.

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CERTIFICATE

We recommend that this thesis be placed before the examiners for evaluation.

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List of Abbreviations

APERC	Asia Pacific Energy Research Centre
ANEEL	Agencia Nacional de Energia Eletrica
BRICS	Association of Brazil, Russia, India, China, and South Africa
CESC	Calcutta Electric Supply Corporation
CEA	Central Electricity Authority of India
CERC	Central Electricity Regulatory Commission
CO2	Carbon dioxide
CTU	Central Transmission Unit
DDUGJY	Deendayal Upadhyay Gram Jyoti Yojana
DISCOM	Distributive Company
DNEP	Draft National Energy Policy of India
EDI	Energy Development Index
EPE	Energy Research Company of Brazil
ESCELSA	Espírito Santo Centrais Elétricas
EU	European Union
FRP	Financial Restructuring Plan
GWh	Gigawatt hours
GDP	Gross Domestic Product
IEA	International Energy Agency
IHA	International Hydropower Association

KWh	Kilowatt hours
LPG	Liquefied Petroleum Gas
LPT	Luz Para Todos
MAB	Movimento dos Atingidos por Barragens
MDG	Millenium Development Goals
MWh	Megawatt hours
MNRE	Ministry of New and Renewable Energy
NGO	Non-governmental Organisation
NLDC	National Load Dispatch Center
NSS	National Sample Survey
PNPB	Programa Nacional de Producao e uso Biodiesel
PRODEEM	Programa de Desenvolvimento Energético de Estados e Municípios
ProÁlcool	Programa Nacional do Alcool
REBs	Regional Electricity Boards
RLDC	Regional Load Dispatch Centers
SEB	State Electricity Boards
SERC	State Electricity Regulatory Commissions
SLDC	State Load Dispatch Centers
STU	State Transmission Units
UDAY	Ujjwal Discom Assurance Yojana
UNFCCC	United Nations Framework Convention on Climate Change

UNDP	United Nations Development Programme
UK	United Kingdom
UKDTI	United Kingdom Department of Trade and Industry
WEC	World Energy Council

Chapter 1

Introduction: The Conceptual Understanding of Energy Poverty and Energy Security

The Historical Background of Energy Security

There is vast literature available today which deals with the concept of energy security (Khatib 2000, Yergin 2006, Sovacool 2014, Energy Charter Secretariat 2015, Day et al 2016). Traditionally the term energy security would involve brisk investment in energy fields to ensure its uninterrupted supply for a country. In the same account, the International Energy Agency (IEA) defines short term energy security to involve warranting a system that would ensure prompt reaction in case of a sudden loss of the supply to energy. That would mean diversification of energy source options. This understanding of energy security has dominated the scope and breadth of energy-based relations between nations in the world. Even today, the conventional perception of energy security revolves around the building of inter-state relations within the traditional security parameter, intrinsically tied to military perspective of security, in tandem with the capability of a country to secure itself from disruptions surfacing beyond its boundary or within, and which has essentially been a top-down approach of security. However, recent academia (Birol 2007, Hoffman 2009) has come to challenge this approach to energy security with the basic criticism being the fact that energy security needs to be liberated from the traditional narrow approach. This has come hand in hand with the understanding that a country's security does not depend only on disturbances generated by foreign nations, but the fact that it also must reflect the socio-economic profile of a country's well-being. Tracing the concept of energy security from the above, one must investigate the implications the concept would have while trying to chart it out from the bottom towards up.

This thesis primarily thus explores the impression of an individual's expression of expectation from the concept of energy security.

Secondly, while energy security has been deemed to be associated with national security, it has been imperative that it is an area exceptionally to be a job of the state. Thus, traditionally energy security, the term per se has always been seen from the perspective of the state. The thesis does not challenge the idea that it is primarily the task of the state. However, while retaining the argument that it is indeed the state's responsibility to secure energy for the country, what needs to be scrutinized is the ways in which the state not only secure energy but also the ways in which it governs this security to ensure sustainable energy for all (all individuals and citizens within the country). The idea thus is to investigate if the state is able to suffice in securing energy for all the consumers and households within its purview, keeping in mind the socio-cultural as well as a political profile of the subjects. The motion is to understand then how far does access to energy in general and energy poverty in particular of individuals in a country must contribute to the recreation of both the concept of energy security and its goals in a modern world. This is where the question of energy governance comes inherently trussed with the idea of energy justice (Sovacool, Dworkin 2015). The thesis takes a look at this concept and tries to enumerate links between the same and the concept of energy security and its subsequent implications.

With the rise of non-traditional security threats across the world, there has been the rise of the study of security from below, whereby poverty has been viewed to be an important issue contributing more to instability, be it economic or political, of a country (Alhajji 2008; Hoffman 2009). Security has thus come to be viewed from the perspective of the citizens, whereby a country's security has come to be illustrated tracing from individual insecurities of citizens. Bringing in energy here, from the government's perspective, it is the duty of the government to secure energy for the purpose of smooth running of the economy, as well as make prospects for energy supply in times of major energy disruption. This forms the crux of a country's

energy policy. However, the duty of the government also lies with making roadways to greater and wider diversifications for ensuring energy security in case of disruption arising from any political or geographical crisis in primary energy source countries. This diversification must not only mean seeking energy ties with multiple countries with rich energy resources required but also seeking to diversify energy resources from hydrocarbon reliance to renewable and other alternative sources, keeping in mind the rate of depletion of hydrocarbons internationally and also the question of sustainability and environment degradation. Lacking the above has considerably led to the creation of energy poverty, which in turn in this context has acted as a security threat multiplier of any particular country. Also, the policy initiatives of the government of the country in question need to be scrutinized keeping in mind the fact that it is the quality of governance that decides the accessibility to energy by a citizen. A country might be able to produce a comprehensive amount of energy, secure a sizeable amount of energy, and yet be at the rudimentary stages at ensuring access of energy to all (Pachauri and Spreng 2004; Bhattacharyya 2006). It must be noted that energy poverty arises from the lack of access to clean and sustainable energy by individuals (International Energy Agency). This lack of access may crop up from various loopholes in comprehensive energy governance by the country in question. It must be imperative to not only seek and decipher the policy initiatives of governments that propel energy accessibility and alleviate energy poverty but also measure these loopholes in energy access that further feed energy poverty. Thus the main thrust of energy security, as to be investigated by this thesis, is to consider it lying with the handling of energy resources in fueling not only the macroeconomic considerations of the nation but also ensure the reach of energy to every individual amidst the fact that even while there has been extensive research in the study of energy security of developing nations, extremely low or almost no consideration has been given to the study of energy poverty in these regions (Birol 2007).

Energy poverty does not originally form a part of the Millenium Development Goals, per se. However, energy poverty does hold a considerable foundation in understanding poverty and thus formulating ways to alleviate inequality as well as embark on the fulfilment of these goals. Today, in all practicality it can be comfortably projected that without ensuring eradication of energy poverty, the goals enumerated in the MDGs cannot be successfully achieved. The cost of energy poverty, to begin with, is immense, overlapping beyond mere economic consequences especially when the term has come to be extensively associated with developing countries, to which the phrase has come to occupy a completely different grasp than the developed countries. Even if viewed in mere economic terms, associated primarily with rural areas in the developing regions of the world, it would be interesting to point out firstly, that the very use of biomass in the rural areas is a costly affair in itself. Again, the smoke from the wood leads to health hazard, the cost of collecting biomass for cooking or for fulfilling other energy needs entails involving immense time in doing something that could have been replaced by other activities essential in an individual's daily lives, like going to school and attaining education for children, and earning income in case of adult individuals. Also, there is a gender aspect to this entire phenomenon. It is generally the women in the developing countries who are traditionally entrusted with the responsibility of collecting fuel for a household, making them vulnerable from toxic gas emanating from unclean fuel and prone to an extreme health hazard. Lastly, the insufficiency of availability of traditional energy sources in the rural areas contributes to immense pressure in the urban areas and propels unplanned and unsupervised urbanization, and increase in the number of urban poor. Later, the Sustainable Development Goals came to elaborately however include the necessity to bring in the question of affordability of clean energy in the energy security discourse. It was found out that it is the lack of clean energy that contributed to the lack of development in the developing regions of the world with lack of access to the electricity grid as the primary point of reference. However, it needs to be enumerated after further investigation of what is exactly meant by access to the electricity grid in the first place. Further, does

only access to electricity suffice in alleviating energy poverty and providing energy security to all? This is a question one needs to ask at a later stage, which this thesis attempts to raise. However, it is without a doubt that the sustainable development goals provided a structured approach to annihilating the idea that energy security must limit itself to the matters of energy export and import confining heavily to geopolitical considerations of the world. It became pertinent that it is the responsibility of the state to not only secure energy to upholster its geopolitical positioning, but also it becomes the unquestioned obligation of a state to make sure that this energy that it must secure must also be distributed to its roots, to its citizens, ensuring sustainable energy access.

The above thus nudge us towards critical scrutiny and review of how a particular country has dealt with energy design in its national policies. The impetus to move towards a comprehensive energy security today, alleviating energy poverty thus, would involve critical hard work on the part of the governments to arrange energy and equip the teeming masses with energy. This would enmesh a number of rather complicated policy initiatives taking into consideration various factors, especially exclusive to the country in question. The renewed awareness around approaching energy security from the viewpoint of the citizens and not only from the state has awakened an elaborate discussion on the scrutinizing and exploring these policies of the state whereby to derive whether they are in tune with the energy needs of the common masses. At the grass-roots level, it is not only thus the need to understand the ways to ascertain and assess the access of the subject to available, uninterrupted source of sustainable energy, but also to deduce right at the outset what exactly is their energy need. This research thus delves into these complex characteristic of energy poverty and various policy initiatives to alleviate so in the case of developing nations.

According to the United Nations, energy poverty is the impossibility of households to choose energy services. The impetus of the research is to understand energy security from the prism of energy poverty and enumerate

how without taking into consideration the modalities of energy poverty, the goals and ideals of energy security cannot be achieved. With the case of both India and Brazil, an attempt would be made to take account of the energy poverty situation in these two countries and gather the energy policies and strategies of these countries, so as to understand if they are in tandem with the access of the citizens to sustainable energy.

Brazil and India has been chosen as the basis of this research in comparison, particularly for few purposes. Firstly, Both Brazil and India are developing countries whose main economic activity is agriculture. Both these countries, however, form a very important part of the developing part of the world. Both Brazil and India are the fastest-growing economies in the world. Today while Brazil is the ninth-largest economy in the world, India, on the other hand, occupies the sixth position in terms of growing economic status. Even though the character of the economies of these two countries might be unsimilar in various ways, it can be said that the trajectory of economic development of these two countries can be comparable. These two countries form a part of the BRICS nations, which are paving an indelible path towards unprecedented economic development. However, these two economies haven't yet developed into economies where the benefits of the economic development would seep to the poorer section of the countries' population. There is widespread income inequality and their levels of per capita income and the gross domestic product are low. Needless to say, as it is clear from innumerable research before that the economic development of a country remains tied to its energy security, Brazil and India are not different. Energy security scenario in both these countries is exclusive and representative to the energy security scenario of the developing world. There is a need to study the implications of energy poverty in the polity and society of these burgeoning economies.

This research would thus attempt to map the energy poverty plot of these countries in comparison. The research should be able to create a clear picture of the energy gap between the two countries and find the shortcomings within the policy initiatives at the part of the government in bridging these gaps. The

impetus would be to essentially focus in the study of energy poverty and related energy policy initiatives of India and recognize its fuel deficiency scenario and lack of access to energy to its people in a comparative investigation into the energy policies of Brazil. The research would draw from past research in the same field of academia and in turn prove to be a basis of future inquisitions in the same province. The time frame chosen for the research is between 2006 and 2015. It was in 2003 in the case of India, and 2004 in the case of Brazil when electricity Acts and framework laws have been documented. This research would investigate the implications of these actions on the part of the two countries from 2006 onwards so as to understand how the above energy legislations have been a turning point in making energy services accessible to the population, if at all. Especially in case of India further, the Integrated Energy Policy Report was submitted by an expert committee constituted under the auspices of the Planning Commission of India in the year 2006, which aimed to 'ensure adequate supply of energy at the least possible cost' (Integrated Energy Policy Report 2006). This would help in a comprehensive understanding of the energy policy of India. National data for electrification and overall access of the citizens to energy resources in both the countries would be studied till most recently available in the public domain that is 2015 to have a comprehensive insight into a decade of electrification drives in India and Brazil.

By choosing Brazil and India a deliberate attempt is being made to have a general understanding of the energy poverty scenario in Latin America and South Asia albeit in a comparable fashion. This is keeping in mind the fact that societies of these two countries in particular, and any two regions, in general, are exclusive in manner. Inevitably their energy demands and energy poverty levels and scope would be different. Thus a comparative study of these two countries will open a scope of understanding that has not been dealt with till now. It would be appreciated if the experiences of the two countries can be exchanged in any way, overriding geopolitical considerations of traditional energy security paradigm. In the process, the research would also

try to analyze what are the social barriers in these two countries and comprehend if the policy implementations are in tandem with these social considerations.

The impetus of the research would be to look for citizen's perspective of security of energy in their day to day lives in India and Brazil with respect to an empirical study of the energy gap of the citizens in the access to clean and affordable energy options. This would also contribute to understanding the width of energy security. At the culmination of the thesis, there could be a general understanding of energy poverty and its dimensions in the developing regions of the world, as experienced from Latin America and South Asia through India and Brazil. The expectation would be to culminate the thesis in research of importance amidst contemporary energy poverty debate. The research would pave the way to a more comprehensive understanding of the bearings of energy poverty on energy security and shall attempt to be a basis for further research in the area both for academic as well as policymakers.

Literature Review

Theoretical basis of understanding Energy Poverty:

Tentatively energy poverty broadly means access to clean energy needed in households for the purpose of cooking, heating, powering appliances (Behrens et al 2012). On the other hand, there is no universally accepted way in which to define what exactly is meant by the term 'energy accesses'. It is reflected in It is on this basis it is understood with respect to household's and individual's access to energy sources, taking into consideration the reliability of the source, the affordability, the quality and adequacy of the fuel (Behrens et al 2012). Then again, there is no clear understanding as to what is the bench-mark to be the minimum need and requirement of a particular household to define and understand energy poverty. Studies would enumerate that energy poverty in absolute terms and relative terms would probably mean very different things. Thus, what energy poverty is for the developed world might not be the same for the developing nations. There is thus a general ambiguity around the term

leading to a lack of awareness among the international community over the same. This thesis aims to enumerate the definition of energy poverty at the conceptual level.

Energy services are one of the prime cogs not only towards the economic development of individuals and communities but also, contribute essentially towards the social development of these individuals and communities. It does bequeath human security on a daily basis. Energy poverty today affects about a third of humanity which has a subsequent impact on health, education, productivity, income, gender equality and the environment. Majority of people lack access to clean and sustainable energy belong to rural areas in the developing world, e.g. in the Sub Saharan Africa or Asia. What is in contrast to this phenomenon is the fact that the population in these areas faces rapid industrialization, and economic development, which catapults its demand for energy. Thus in all practicality what befalls these regions, is a stark gap in access to energy for the citizens. While analyzing the relationship between energy and economic development, the distinction has been elaborated by scholars to be at four levels, namely, basing on survival, the basic quality of life, amenities and internal collaboration (Yeager 2001 as cited by Pereira et al 2010).

Again, energy poverty is a multidimensional phenomenon. Long term understanding of alleviating energy poverty would mean an uninterrupted supply of energy to bolster economic and social growth of a country. Energy can be seen both as an end in itself and as means to achieve those ends (Chaudhary et al 2015). On the other hand, while looking at the term in the short term perspective, it would mean a lack of access to modern energy services. It would thus come to be closely associated with ‘poverty’ denoting deprivation of basic human needs (Chaudhary et al 2015).

This is where the work of Rosie Day, Gordon Walker, and Neil Simcock become important. They look at energy perspective through the prism of Amartya Sen and later Martha Nussbaum’s capabilities framework. They try

to build a definition of energy poverty based on the capability approach, so as to ‘conceptualize and monitor the relationship between energy and wellbeing in different parts of the world, particularly between more developed and less developed regions’ (Day et al, 2016). This viewpoint looks at energy poverty at the levels of both the developed and developing countries and essentially challenges the prevalent understanding that with reference to developed countries energy poverty means to sustain levels of energy consumption. Their study finds that the above perspective conflicts with the ‘global need for a reduction in energy use’. The terms to reduce global energy consumption, on the other hand, weighs heavy on the developing countries which characterize the rapid rise of energy demand in tandem with their growing economies. Thus, energy poverty must be theorized in the equitable terms for both the developed as well as the developing regions of the world. Energy poverty in terms of the developing countries must be made equitable keeping in mind their capabilities thus.

Further, in popular discourse in earlier research energy poverty has been essentially seen as something to do with a household’s ability to pay for heating in the developed countries, necessarily tied to thermal comfort. There is little recognition that the energy consumption pattern might vary from household to household. The fact that fuel poverty might have a greater impact in the day to day lives of individuals has been less recognized if not completely ignored (Day et al, 2016). The understanding of fuel poverty in the developing regions, on the other hand, is completely different being tied to lack of access to clean energy, to begin with affecting the ‘well-being and quality of life’(Day et al, 2016).

The consumption of per capita of electricity has a correlation with the well-being of the subjects making the countries with less per capita consumption of electric energy rank low in the human development index and those with better per capita consumption fare better in the said index (Pereira et al 2010). This is also indicative of the fact that the absence of a pathway to electricity aggravates not only a country’s energy poverty but also its overall

wellbeing. Thus there must be a framework to understand what would be the fundamental threshold of minimum per capita energy consumption of energy in a household, or by an individual, that ensures the alleviation of the subject beyond the energy poverty level. That is where the research in this study is trying to make headway into so as to get a clearer picture of the elemental spaces which public policy initiatives of the government must focus towards. There is another aspect of rarely studied understanding of energy poverty which correlates with social cohesion. The developing countries have a very particular character when it comes to its societies, which are fractured in the line of caste, class and ethnicity. Since this study would be an investigation towards the multidimensional character of energy security, it would be ludicrous to miss out in trying to examining these social rationale that in all definitiveness must have an impact on energy poverty. Also, the impetus is to investigate if the social positioning of an individual or her/his household has in any way have any impact on their access to energy resources.

Bearing of Energy Poverty on the Concept of Energy Security

The concepts of energy security in academia came to be developed in the 1960s and attained its form within the traditional security paradigm encompassing geopolitics in the aftermath of the global oil crisis after the 1970s (Cherp and Jewell 2014). Later in the 1980s and 1990s, energy security came to be synonymous to the security of oil supplies (Alhajji 2008, Cherp and Jewell 2014). Keeping the prevalent geopolitics in mind, energy security has always been entangled with the security of supply chains of energy, be it oil, or later gas. Earlier, be it at the inception of the term energy security in the early 1960s or during the 1970s when the term gained primacy in international security paradigm, it essentially meant security energy supplies to countries (Cherp and Jewell 2014). This gave a distinct geopolitical tenor to the concept whereby, the idea was to fit in the concept within the traditional security framework.

However, the concept of climate change mitigation came to be included in a massive way during the early 2000s within the purview of energy security. The impetus to understand energy security beyond limiting considerations of geopolitics came in the form of increased dialogue in academia with the inclusion of the 4As of 'availability, accessibility, affordability and acceptability' in the Asia Pacific Energy Research Centre (APERC 2007, Cherp and Jewell 2014). With further discussions in the Asia Pacific Energy Research Centre in 2007 and the approach of the Sustainable development goals, access to energy and the implications on individual and social development, in case of lack of this access slowly started leading towards the perspective of energy security from the viewpoint of the individuals, whereby the concept of energy poverty was developed having significant bearing on the idea of energy security. It came to be recognized that developing countries, like the ones from South Asia, Africa are not only economically poor but also suffer from energy poverty, whereby the common masses do not have admittance to clean sources of uninterrupted energy in their day to day lives (Birol 2007). This negatively contributes to their freedom from want, freedom from fear and freedom to lead lives with indignities of all sorts. Thus, energy security today has come to encompass a wide array of considerations, entangled with one another. To 'secure' energy security, a government of a country must go through several considerations and securing a large amount of energy does not necessarily mean that there is an efficient distribution of the same for the benefit of the teeming masses of the country. Thus while the term energy security, as we know today, does depend on where in society one sits, the understanding of energy security must be in fact propelled to be inclusive of all the sections of the society.

These values while came to be attached to the concept of energy security making it a concept of research asking some serious questions regarding who it is that the security must be directed to and for which values. The question of energy security was for the first time came to be not limited to only the importers and exporters of the energy resources. The intention was to

understand energy security not only within the traditional geopolitical paradigm but also to cater to the diversity of energy security depending on where in society one sits giving it a multidimensional hue (Cherp and Jewell 2014). The idea of 'availability and affordability' is enumerated in the International Energy Agency's definition of energy security elaborately yet precisely (IEA 2014 https://www.iea.org/topics/energysecurity/), while 'accessibility and acceptability' came to be developed by the World Energy Council in the Millennium Declaration, albeit not so much in terms of energy security though. It was the APERC report that for the first time connected the 4 As distinctly with the concept of energy security (APERC 2007). Energy security, however, came to be intrinsically associated with poverty while a detailed study of energy situations in the developing countries of the world has been made. It came to be established that energy security, in the geopolitical terms, limits the in-depth analysis of energy security, leaving out a wide section of the developing society who cannot access energy due to their poverty (Kanagawa and Nakata 2007). This is where the idea of access to energy gained primacy over the inclusive concept of energy security. Access to energy was coupled with the development of individuals and collectively the society. Issues like population growth, urbanization and lifestyles have an independent and important bearing on energy consumption that cannot be determined with a top-down approach to energy security (Reddy 2000). The concept thus was given a gentle push towards its inclusive character to understand energy poverty, thus arising out of lack of access of individuals to clean and sustainable energy, having a significant bearing on the analysis of energy security beyond the traditional supply-driven approach treating energy security as a mere strategic issue (Reddy 2000).

The concept of energy poverty is thus derived from the above understanding of energy security whereby the idea developed with the passage of time to include energy poverty. Energy poverty in itself has emerged as a complex issue where the focus of discussion remains at the root of energy security. As enumerated before, the question one needs to ask while dealing with energy

poverty is to whom the benefits of energy security must seep to. While traditionally it came to be limited to macroeconomic considerations at best after geopolitical considerations, today the focus of this discussion centres around individuals. Individual energy insecurity marks a heavy bearing on state energy insecurity paradigm. Individual energy insecurity dilates underdevelopment and propels a country towards internal insecurity that is hard to manage. As Reddy observes, 'energy is to be tackled in such a way that social problems are at least not aggravated' (Reddy 2000) it becomes the intrinsic responsibility of a state to formulate energy policy keeping in mind the necessity of individuals' access to energy, ensuring energy security in a wholesome manner. Reddy in his chapter in the United Nations Development Report 2000 identified the lack of choice to assess affordable, clean, safe and quality energy services, as energy poverty contributing to constraints on human development. He essentially pointed out that the necessity is to look at energy services to be determining factors in contributing to energy poverty and not energy resources like coal or oil. It is the lack of access to energy services according to him that contributes to energy poverty and thus should be treated as the end (Reddy 2000). This is the basic way in which the concept of energy security needs to be furthered and equalized incorporating the concept of energy poverty

The issue of energy poverty today has thus attained a certain urgency. It is glaring that even while the international community recognizes a number of basic rights like the right to water, the right to food, the right to health, the right to adequate housing, the right to gain a living by work and the right to take part in cultural life (http://www.humanrights.is/en/human-rights-education-project/human-rights-concepts-ideas-and-fora/substantive-human-rights/the-right-to-an-adequate-standard-of-living), missing from this list is the right to energy. However banal it might seem while discussing matters of international importance, the need for energy to cook food, to heat the home, to earn a living, to benefit from good health and education services form an essential and inalienable part of human

sustenance. Energy poverty denies people a basic standard of living that should be available for all. It needs to be reiterated here that denial of affordable access to energy to the citizens of a country surmounts to denial of human rights and security for that matter. If a woman has to trek to long distances to gather wood to cook, it hampers her health and freedom from want. If a child has access to electricity only in a part of the day, her/his education gets negatively affected culminating to impeding freedom from indignities in the long run. Thus, energy poverty augments human insecurity. The non-provision of electricity in schools, clinics, hospitals and community centres also essentially contributes to human security.

Energy Poverty in India and Brazil

Energy poverty is a lesser-known phenomenon in developed countries. Today when one talks about energy poverty, the focus is driven towards the developing countries. However, energy poverty has been relevant in the context of the developed countries as well, with respect to struggle towards providing affordable energy to 'low income households'. For example, the reference to and the recognition of the term energy poverty with respect to the EU first came while preparing the Third Energy Package in 2009 (Bouzarovski et al 2012). It was recognized for the first time that energy poverty was a by-product of liberalization and subsequent global economic crisis, as a result of which an attempt was made to ensure the interests of the consumers while formulating energy policies at both the national as well as regional level by the European Commission, however unable to generate interest among the member nations citing the lack of clarity with respect to policy implementations at the country level (Bouzarovski et al 2012). As a result, with the lack of timely intervention, the lack of relevant awareness towards energy policy in Europe have lead to the steep rise in the price of electricity in certain regions. Even while there is coordination of energy trade within the region and the attempts towards the transition from traditional energy generating mechanisms to renewables and nuclear energy, the issue of affordability of energy resources has lagged behind. Energy poverty to the

countries of the developed section of the world, thus, does not mean the disruption or disconnection of individuals and households to the established energy grid, but an issue of maintaining order in the price mechanism.

With respect to developing countries like India on the other hand, the meaning and scope of energy poverty are completely different. Developing countries still depend on traditional unsustainable sources of energy accumulation, which also have grave health implications and ramifications on the environment. There is also a fundamental problem with access to productive energy resource in these regions. Energy access would also include lack of access to the electricity grid in the rural areas of developing countries. Also, these countries are plagued with poor urban households further impeding the process of access to energy (Coelho and Goldemberg 2013). Lack of electricity to the society tends to increase social divisions and disproportionate imbalance in the society (Pereira et al 2010)

Both India and Brazil are an important part of the BRICS, which is an association of countries which have proven in the last couple of decades to be the emerging economies of the developing part of the world. Both Brazil and India are two of the fastest-growing economies of the world today in comparison to the big developed countries of the world. While India is the largest economy in South Asia, Brazil is the largest economy in Latin America. This economic growth requires the backup of energy stock that can feed the industrialization in these two economies. While India is the third-largest consumer of energy in the world, Brazil holds the seventh position in energy consumption in the world, the highest in Latin America (Global Energy Statistical Yearbook 2016 https://unstats.un.org/unsd/energy/yearbook/default.htm). The relationship between economic growth and energy consumption has been studied extensively by academicians (Aqeel and Butt 2001; Soytas et al 2001; Wang et al 2015). And these relations since being varied in the context of different countries need variant policy initiatives.

There should be satisfactory policy initiatives ensuring access to electricity at the level of the government of these regions to alleviate energy poverty in totality in the model of a public-private partnership (Coelho and Goldemberg 2013). International Energy Agency notes that universal energy is almost a reality in the case of Brazil. The country has become one of the 'least carbon-intensive' countries despite its energy demands doubling since 1991 (http://www.ies.org/countries/non-membercountries/brazil/). Brazil in this regard has made progress by making access to electricity grid free of any charge. However, the introduction of pipe gas for the purpose of cooking has had very less impact with few major cities getting its benefits (Coelho and Goldemberg 2013). Brazil has made some comprehensive move towards renewable energy (Pao and Fu 2013). Today the use of bottled LPG is growing in Brazilian households from 80 per cent of the households using depending on charcoal and fuelwood some 40 years back (Coelho and Goldemberg 2013). About 97 per cent of Brazilian households has access to electricity, which includes about 97 per cent of rural households (Pereira et al 2010). For a booming economy, that is a great feat.

However, there is the question of whether access to electricity grid means access to uninterrupted electricity throughout the day, where a further investigation into the case Brazil needs to be made. Also, it needs to be observed that the electrification programme at large has been an initiative at the part of non-governmental organizations (Coelho and Goldemberg 2013). And investigation in the thesis would like to observe why the involvement of the government in such cases is low. Studies also reveal that even though a large and comprehensive part of the Brazilian population does have access to electricity, the shift of the energy system towards alternative and renewable energy sources have negatively affected the quality of electricity with low voltage, interruption in power supply, and increase in the cost of electricity (Pereira et al 2010). Brazil's used to be one of the fastest-growing economies of the world. However, in recent years, Brazil has begun facing difficult political and economic situations which are likely to affect its domestic energy

security position. Corruption, an important characteristic of developing economies, both India and Brazil for that matter have an impact on the development of these regions. Supply of energy in the form of electricity gets affected by corruption as well, in the form of disruptions and increase in energy tariffs.

In India, the alleviation of poverty forms a cornerstone of its socio-political policymaking. Ideally, thus energy policy and its modalities within an inclusive energy policy must not stand to be ignored at any cost. This study would make and attempt to do an empirical study into the need to investigate into what energy poverty thus means in the context of India and what would be a comprehensive and inclusive energy policy on the part of the state to alleviate energy poverty. With respect to Energy Development Index (EDI) India has an average EDI of 0.295 lower than countries like China, and South Africa (Razdan 2015). Further, there is a wide level of disparity between the Indian states with respect to EDI. Even while access to electricity grid increased over the years, the energy poverty situation has hardly improved in the country. There is a great disparity in the essence of the sense of access to electricity in India. Even when data might prove that the number of areas to have been linked to the electricity has increased in India, the fact of the matter is that just providing electric connections do not reflect the accessibility of households and individuals to quality and uninterrupted energy services. There is a disproportionate distribution of linkage to the energy grid. Further, the Indian economy is still depended heavily on oil imports from external sources. Its renewable energy resource capacities remain largely unexplored, be it with respect to solar, wind or hydro electricity. In fact, hydropower capacities have rather fallen in the past few years (Razdan 2015). On the other hand, India has developed a good prospect for nucleahydroelectricityr power generation. This research would further look into that perspective and analyze if nuclear power capabilities would transcend socio-political barriers to fill in energy poverty in the country. On the other hand, India has pledged to improve its GDP

emission intensity by 33 to 35 percent by 2030 (Aggarwal 2015). It needs to be seen of that target is actually met in given period of time.

The study would look into the policy initiatives essentially of Brazil and India making a deductive comparative study, whereby the impetus would be to investigate governmental initiatives to surmise the extent and patterns of energy poverty in these two countries. It must be kept in mind that the social structure of both Brazil and India are exclusive. The social structure of the developing countries has a characteristic of being different from that of the developed ones. There is social categorization based on class, caste, and ethnicity which often become social barriers. Energy access to the citizens must transcend these barriers and become inclusive in character. There should be a systematic review of public policies by the government to take into consideration the necessity to alleviate energy poverty in the society in the above regard as well. That way it shall have its positive impact on not only the economy but in the overall well being of the society.

Policies towards Alleviating Energy Poverty in India and Brazil:

Policymakers today, while dealing with energy security must keep in mind the multidimensional character that it has come to attain with years of research. Today, energy security does not simply mean the necessity to secure energy by an international bargain mechanism to uphold one's geopolitical primacy after geopolitical considerations. But, energy security must incorporate the aspiration of individuals towards inclusive development. It has already been established that energy security must take into consideration the sustainable development goals, making sure that clean and affordable energy is available to all individuals in a society. For this, there must be ample domestic policy initiatives that must propel the citizens towards better access to energy sources and products.

The overall energy access situation of India can be found in the in-depth study of the reports published by the National Sample Survey Organisation of India. Data indicates that about 70 per cent of Indian households, majority of which

remain in the rural areas of the country and live in abject poverty are the ones who still rely on traditional energy sources for their regular and daily energy needs (Bhattacharyya 2006). The same data also shows that about 90 per cent of the rural population in India use traditional energy like firewood, crop residue or animal wastes to attain their energy needs. On the other hand, while there might be the availability of LPG pitted against traditional firewood, which should be a lucrative option to the rural population, the cost of the same becomes a deterrent to the choice. While firewood is easily available without any cost to the population, switch to LPG comes at a larger cost, discouraging the rural population against the energy transition (Sovakool and Drupady, 2012). On the ground, there are several policy initiatives that have been undertaken by the government of India to make energy access easier to the energy poor. Simplistically put, there is a strong presence of the public sector in the dissipation of energy to the poor population living in the rural areas. There is also the prevalence of the presence of subsidies in the field of electrification of rural areas. The rural electrification programme in 2004 has distinctly has taken initiatives towards village electrification as well as providing electricity for irrigation purposes. However, this electricity programme has not been all-encompassing. The definition of energy poverty thus largely eluded the rural households of India for a very long time (Bhattacharyya 2006). There must thus be a long way for India to go to light all the rural households indeed. Several schemes have been introduced to provide financial assistance to the poor to access energy. However, this assistance largely falls short in reaching the desired goal. This is, largely, because this financial assistance is in the form of loans, which the poor find difficult to repay and end up becoming a financial burden on them. There is also the lack of high-quality power to these households whereby the assumption of the power load is based on vague and sometimes arbitrary assumptions by the regulatory bodies (Bhattacharyya 2006). Thus merely connecting a household to the grid does not suffice alleviation of energy poverty. Securing one from energy poverty is achieved by meaningful access to power. While there is the access of households in rural India to power, the

quality of power to these households and the additional financial burden along with it makes the situation not very conducive to say that individuals do actually have access to power. Though there have been discussions around the bulk purchase of power by the federal government and further management of the distribution of electricity to households, the matter gets stuck around the management as to how would the mechanism exactly be formulated with the participation of the local population. Further, the system governing the distribution of power and thus access to energy at the level of households is very different. Power production and distribution is conducted through a very 'top down' approach (Slough et al 2015). The strategy has been till recently to increase access to power by households through connection to the already existing electricity grid and there is almost no involvement of local communities being encouraged. This is very different from the case of Brazil.

With respect to Brazil, Brazil is on its way technically to achieving full electrification for itself. In fact, by the statistics of the year 2012, Brazil's electrification rate has reached 99.5% (https://data.worldbank.org/indicator/eg.elc.accs.zs?end=2012). The 'Luz Para Todos' (LPT) programme that is translated to 'Light for All', has been widely applauded by researchers and scholars alike on achieving such great heights in the electrification of households in the country (Slough et al, 2015). The LPT programme was initiated by the then Minister of Mines and Energy of Brazil, under the auspices of President Luiz Inácio Lula da Silva. The president in subsequent years came to be immensely praised for this electrification programme. However, it must be also noted that President Lula subsequently came to be charged with a sentence of nine and a half years in prison in 2017, recently, for involvement in corruption with Petrobras, the leading energy corporation of Brazil, among various other charges of malfeasance (Phillips 2017). The LPT programme was launched amidst several other welfare-oriented social programmes like the 'Fome Zero', meaning 'Zero Hunger' and the 'Bolsa Familia', meaning 'Family Allowance' programmes.

However, the inception of Brazil's electrification programme can be traced to before president Lula's initiatives as well.

The Programme for Energy Development of States and Municipalities (Programa de Desenvolvimento Energético de Estados e Municípios-PRODEEM) was initiated in the year 1994 through a presidential decree, with the specific aim to provide energy to the rural households among the dispersed population of the country who are away from the regular grid connection of the country due to several geographic reasons and the energy consumption of such areas are low as well (Galdino and Lima 2002). Hisham Zerriffi in his book 'Rural Electrification: Strategies for Distributed Generation' notes that despite the intention of the PRODEEM programme, which was mainly based on Photovoltaic (PV) systems, it failed to provide sustainable electricity to the dispersed rural population for long due to lack of proper long time planning, lack of expertise and proper equipment (Zerriffi 2011). While the PRODEEM was aimed at providing electricity to the rural areas through community involvement and community installations, the 'Luz no Campo' programme (meaning- Light in the Field) which came later in the year 2000 wanted to achieve the same aim through by accessing individual households for the same (Slough et al, 2015). Scholars note that while these two programmes were making some changes, like overall access to electricity did increase from the 1990s to 2000, however, the rural areas still remained largely away from this access. One of the main reasons scholars believe that these policies failed was the unavailability of a separate regulatory body for energy distribution to the rural areas. All that was taken into account by the LPT programme (Slough et al 2015). This research aims to look into the details of and analyse the result of the electrification programme within the proposed timeline of 2006, where it is expected that the results of the LPT programme must have come to fruition, if at all. Also, there would be an investigation to understand if all the households of Brazil, especially keeping in mind its social constituency were able to reap benefit from this electrification programme, despite their social positions.

There are around 1,000 power plants presently supplying electricity for villages in the utilizing diesel oil. There is a reward system in place for electricity companies for providing electricity to households not attached to the electricity grid (Slough et al 2015). However, in comparison to India however, the rural electrification programme is rather rudimentary and not democratized. There is essentially a lack of incentive towards rural electrification to private initiatives (Coelho 2008). There is a visible lack in the part of the government towards taking initiatives for a decentralized mechanism to distribute power to the rural households. There is recognition of the fact that there are physical impediments towards the distribution of power to rural areas, especially around the vast Amazon belt using conventional mechanisms (Coelho 2008). Thus there is the need to resort of unconventional means that has been felt by the policymakers. The LPG programme has emerged to provide an alternative to this process. Further, the renewable energy programme has also provided a major boost towards the distribution of energy in Brazil. However, research shows that there has been comprehensive growth towards electrification programmes in Brazil which has connected the vast majority of the population to the electricity grid (Pereira et al 2010). How much that has been able to reduce energy poverty in the country needs to be investigated in the research. Brazil has achieved self-sufficiency in crude oil in 2006 and is also a world leader in both production and use of ethanol (IEa 2006 https://webstore.iea.org/the-energy-situation-in-brazil).

Scholars like Tara Slough, Johannes Urpelainen and Joonseok Yang find the extent and success of the electrification programme, especially to the rural households, as the programme promised at the outset, rather ‘elusive’ (Slough et al, 2015). They tethered their study to the less developed municipalities of Brazil with the intention of analyzing the correlation of the human development index and electrification rate of the country. They wanted to understand and investigate if electrification drives and increased rates of electrification actually would have some significant and tangible result on the human development index of a country. Brazil is positioned as a country with

relatively good human development index. Also, keeping in mind the fact and figures that point towards a successful electrification programme in the country, the scholars wanted to see the electricity in the lesser developed municipalities and unearth the practical situation at the grassroots level and note whether the situation in place has a reflection in the human development index. When it comes to regions in Brazil where the electricity grid has not been comprehensibly enhanced, the most familiar argument has been inaccessible geography of the region. This kind of geographical circumstance, the scholars successfully argue is the case of many large countries as well. Later in the study, an attempt would be made to understand if the same is relevant in India, which also falls into the category of being territorially substantial and geographically diverse. Scholars also noted that this study would essentially be important in gauging the future routes to be taken in extending energy access to the population and households residing and situated in these difficult geographical terrains. Initially at the very least, it would be incidental in understanding, in case these regions have been connected to the electricity grid, how and whether there is the need for 'distributed energy sources'; or in case of non-access to existing electricity grid must and would provide for future reflections into further investments and policy initiatives if needed towards new energy sources in the region. Brazil thus became a very important case in building an inclusive insight in the study towards strategic energy resource and source building for the future, not only for Brazil but also for other countries with similar conditions. There are still factors that need to be minutely studied, keeping in mind the geography of the countries of both India and Brazil, to understand the implications of generic policy initiatives to distribute energy to remote areas of these countries and what might be alternatives thereof.

There are projects to move towards the introduction of decentralization tactics to improve access to electricity, even contributing towards making the process cheaper. However, centralized power capacities still prevail in these areas. There is clearly a lack of policy initiatives towards decentralization. While

renewable energy coupled with decentralization, does provide a lucrative opportunity for cost-effective access to in the rural regions of these developing countries, what is unclear even today is if renewable energy like wind, solar, hydro and biomass have exactly how much potential to fill in the gap of energy poverty. Also, the social and environmental consequences of renewable energy system still remain ambiguous (Behrens et al 2012). The use of renewable energy as a part of large scale installation yet remains unexplored, especially in developing regions of the world. This has not yet been tried and tested per se.

Further, in the light of lack of finances and capital to popularize renewable energy, the responsibility to set up renewable energy capacity still remains tied up to the willingness of the government and the state (Behrens et al 2012). In the case of lack of policy initiatives by the government, the possibility to bridge the energy gap shall remain but a distant dream.

In this regard, it is the international community again which comes to be looked up at in resolving the situation like various mechanisms set up by the likes of the UNFCCC, the Clean Development Mechanism, etc (Behrens et al 2012). In that case, the entire process gets tied up to the 'benevolence' of aid from the developed countries towards the developing countries in this regard. This again has its own pitfalls, for example, to begin with, international aid from the developed countries would essentially depend on the willingness of the developed countries to alleviate energy poverty along with their commitment towards issues related to climate change and energy equality. Further, it would also depend heavily on the international relations between the countries requiring aid and the countries partaking of aid. Also, when it comes to international organizations or big economic regional organizations like the EU, everything would tediously depend on the internal coordination between member nations within the EU to achieve positive response towards international energy equity. Lastly, yet indispensably, since most of or probably all developed countries are economies essentially run by humungous multinational corporations, there is the dilemma of the uncontrolled march of

the market in developing economies, which stands to indeed a problem in the light of the fact that competitive capitalist market has not really proved to be an equitable option towards ensuring human security in both absolute as well as relative terms.

There is agreement further on the point that with the rise of the public-private partnership in energy projects, renewable energy lacks behind in terms of lucrativity (Behrens et al 2012). These projects are less reliable and 'bankable' when it comes to profitable returns to the private investors, leading to a lack of incentive for them to invest further in the field. This is in stark comparison to the history of large scale energy projects involving fossil fuels. Renewable energy projects thus involve more risks for these investors.

The study of cases of both Brazil and India with respect to policy initiatives and policy implementations at the level of the governments would further clear if there are practical possibilities to bridge the energy gap in these countries through the installation of renewable energy alternatives and switch to the renewables. Brazil for that matter has made some considerable head-ways into renewable energy generation in the last decade whereby it reached about 97 per cent of its total domestic electricity generation from renewable sources, namely hydroelectricity biomass, and waste, with hydroelectricity contributing to about 95 percent of electricity generation (Pao and Fu 2013). However, research shows that the economic growth of the country has a negative impact on the consumption of new renewables (namely biomass, wind, etc) in the short term way (Pao and Fu 2013). In the case of India, the country still has a long way to go in accepting renewable sources of energy as a sustainable and uninterrupted form of electricity generation. Most of its renewable sources remain unexplored. There are geographical considerations to estimate whether a complete move to renewable resources is indeed a rational prerogative for India. There is no doubt that India does have a wealth of non-traditional energy resources, be it hydropower generation capacities, wind, or solar for that matter. However, there are practical problems regarding the financing of these capacities given the geographical

barriers that these might pose and economic viability of such projects. It also needs to be seen if there is public awareness regarding the installation of renewables capacities, lack of which might otherwise lead to widespread rejection of the same. There must be the resurgence of public-private partnership in this regard no doubt. However, what might be an important game-changer might be decentralization in the management of these renewables capacities. Whether this prospect has a relevant possibility shall also be investigated by the research in this study.

This study thus would see what have been the policy implementations that has lead the above-mentioned countries to this juncture and try to create an understanding towards the gap existing in energy consumption in Brazil and India whereby an attempt would be made to comprehend what policy initiatives might contribute to bridge this gap. Can there be ways in which local communities can contribute to increasing and sustaining connection of households in the region to the electricity grid? Can lessons be learned from similar situations existing in other countries where involvement of the local communities have proven to be advantageous towards the electricity ventures, and be replicated in the case of India for that matter? These are some underlying questions that the subsequent chapters would undertake. Slough, Urpelainen and Yang observe that another alternative to sustainable energy access can be derived from the generation of electricity remotely at the local level itself (Slough et al, 2015). That might vary from electricity generation at the household level with the help of a simple household solar tapping system, to a slightly larger system enveloping one or few localities at a time through local energy generation system via other renewable sources as well. The main advantage of these systems is the fact that they can be constructed remotely and sustained at the local level itself with very little involvement of the central grid arrangement and cost involved is also less (Slough et al, 2015). This research would like to follow the trajectory of such initiatives, if available, at the level of the two cases at hand of Brazil and India, if they are already at place, or if there is any possibility of the same in the future.

Research Design and Methodology

The research includes the review of both primary as well as secondary literature available on the issue of energy poverty. Energy poverty has been looked at from the experience of two developing countries of Brazil and India. Semi-structured interviews of stakeholders and policymakers have been conducted based on the research in the above-comparing countries. This research looks into 'energy access' at individual and household levels in Brazil and India through their basic energy needs taking into account regional, geographic, social and cultural factors pertinent to the specific target population.

While working towards finding a method that deals in defining and qualitatively approach measuring energy poverty, there are some instrumental works in academics that help dispel confusion regarding the same (Day et al 2016, Okushima 2017, Herrero 2017). Energy poverty has become an issue of critical debate in the EU countries, of late. Scholars have laid down several methods to tackle the same in the European environment. Sergio Tirado Herrero's work (Herrero 2017) criticizes a one-dimensional approach to measuring energy poverty, particularly for the case of the United Kingdom, which according to him did not do justice to understanding it either in the country, nor can it be comprehensively applied in other European countries with different political, social, and economic structure (Herrero 2017). He notes, while the economies of the European countries might appear to be the same, their social makeup make them approach energy poverty differently. There cannot be the same standard to measure energy poverty in all European countries. He recognizes that there is an evident lack of standardization of procedure in measurement and quantification of energy poverty. Also, he problematises the income/energy expenditure model to measure energy poverty by enumerating that it passes by several crucial factors that may give rise to 'hidden' energy poverty (Herrero 2017)- like the demographics of the household studied, objective standardization of comfort heating levels in a household, treating household and not individuals as units of the study for that

matter, the presence of items and services of household use that are in competition with energy services, etc. Energy poverty has become an important constituent of energy discussions in the European Union in recent times (Bouzarovski et al 2018). In developed countries, energy poverty is viewed from a relative perspective, making it a relative term. According to this, it is the affordability factor of consumers that is taken into consideration. The economic poverty of the population or a certain section of the same is taken to be the culprit contributive to energy poverty. It is synonymous to the concept of fuel poverty. It is the economically poor who are seen as the ones who are unable to spend as much for the equitable, say the heating of spaces in their houses, who are seen as the energy poor. In terms of the developing country, the term energy poverty again assumes a different dimension. It is majorly the connectivity of the consumers or sections of the population that contributes to their energy poverty. It is thus absolute energy poverty that they experience. The people in the developing countries thus face energy poverty with respect to their lack of access to modern energy and technologically advanced carriers of energy (Bouzarovski and Petrova 2015). After the Great East Japan Earthquake and the subsequent Fukushima disaster, and the shift in Japan's energy consumption model, coupled with the rise in energy and power tariff rates, there has been growing concern regarding energy poverty in Japan as well. In this context, Shinichiro Okushima's work on methods to study energy poverty in Japan is also instrumental for this thesis (Okushima 2017). Like Herrero's study, this also calls for a multidimensional study of energy poverty, especially in the context of Japan in the recent past. In addition, this article with its reference to the recent history of Japan, does a socio-economic study of the country before and after the Fukushima disaster, that prompted the closing down of most of the nuclear power plants in the country. This comparative study enumerates how economic standards of a country can swiftly shift after a disaster, and contribute to energy poverty levels among the population. On the other hand, the debate around energy poverty has also taken another turn with respect to the question of sustainability, whereby it is today not only the question of whether a household has energy, is connected to

the power grid, is able to comprehensively pay for this access to energy, but also the question regarding what is the type of energy that is exploited to make it accessible to the population, whether it is harnessed from sustainable sources or not (Sustainable Energy for All 2017 https://www.seforall.org/news/the-2017-sustainable-energy-for-all-forum).

Thus, there are not only various interpretations of the term energy poverty, but there are also several ways that the understanding of the concept has expanded over time. As mentioned above it began with the reading of the poor sections of a part of some European countries, who were unable to pay for energy for daily sustenance. It expanded with the inclusion of similar study beyond the Western countries, into the depths of the developing world, where it gathered different constituencies and became a holistic term. From being merely a limited concept related to the state of economic poverty of the consumers, energy poverty became embroiled in the lack of accessibility to energy sources in the developing countries. After the rise in global concern with environmental degradation, especially gaining momentum after the Fukushima disaster, international academia started to view energy poverty from the sustainability angle as well (Bouzarovski 2018). This brings us to the argument that measuring energy poverty in the first place, for a country, might not be standard for any other country. the progress of the definition of energy poverty is example enough that the concept is spatial in character and assumes different meaning in different space, and time. There is a clear allusion to the vastness of the scope of energy poverty in this regard. The demography of a place, its society and the character of its polity are definite factors that contribute to the nature and tone of energy poverty that place experiences (Bouzarovski 2018). This argument also throws light at the context that energy poverty, its definition, standards and measuring criteria must be different for different countries. This study's objective is to do exactly that in the context of India and Brazil. This also has been elaborated at the literature review section in detail. This thesis though does not attempt to deal with quantitative measurement of energy poverty on any account, the methods to measure

energy poverty by scholars in different scenarios provide a foundation for understanding energy poverty in different lights with particularities of different countries in question. Methods to quantify energy poverty can also be taken as benchmarks or route maps to comprehend peculiarity of energy poverty in the case of India and Brazil, recognising the differences in the energy scenarios in both the countries, observing them and identifying the root causes of the concept in both the cases. It is expected that these studies and their models might be applied to gauge the energy poverty scenario also while trying to make a more socio-political study of the same in these two countries.

Also, a very interesting take away from Herrero's piece is his recognition of the fact that most measurement models of energy poverty seem to overlook the responsibility of the state in ensuring access to energy services. There is always some kind of reference involving private investment in the field of energy distribution that omits the crisis that households living with energy poverty might face in the light of the unregulated market mechanism. While the thesis would investigate the energy poverty scenario in India and Brazil, this specific concern shall form a significant part of analysis, whereby it would be considered if private investment or involvement of private capital in managing and regulating energy and power services can do justice in alleviating energy poverty in the developing regions of the world. This particular point would be incremental in the case especially of Brazil, where private firms like the Electrobras and Petrobras is so heavily involved in production and distribution of power and energy to a vast majority of the country. After the opening up of the economy of India as well in 1991, the power sector of the country has been subjected to a number of interventions of the private sector. To understand energy poverty in India, the levels of involvement of the private sector, the areas in which the state has seceded from the sector and what has been the resultant implication of such movement on the functioning of the sector in particular and the energy poverty of the consumers, has been studied in the thesis, and has been laid down in the subsequent chapters.

The objective of this work is to understand energy poverty in the developed countries through the prism of India and Brazil, if that is possible. It needs to be remembered again in this regard that these two economies are developing. Thus, the social and political characters of these two countries are bound to be different from the developed countries like the United Kingdom, rest of Europe for that matter and Japan as well. Taking that into consideration, it must be clear that to a large extent, methods applicable to the developed countries to measure, gauge and define energy poverty might not be relevant in this case, especially in hardcore quantitative terms. The social indicators of well being in a developed country are peculiar to its culture, conventions and traditions, political history and economics. Similarly, socio-political circumstances of developing countries are very different from the developed countries. Further, every developing country differs from one another on various grounds. These factors contribute to energy poverty essentially being a spatial phenomenon (Bouzarovski et al 2018). The aim of this study is to understand these unique particularities of India and Brazil, and decipher its stake on energy poverty. The thrust would be to understand the policy initiatives of the countries in question to eradicate energy poverty. For that, there would be the primary attempt to understand what energy poverty in the cases of the two countries would be. Along with all the merits of the methods enumerated in the studies above, it must be kept in mind that they have been conducted in and are thus relevant to the developed countries if the world. This thesis essentially deals with two countries that occupy important positions in the developing part of the world. In that case, capabilities framework, probably provides a better context to the study, not ignoring the contribution of the two articles above. It must be noted that Herrero too recognizes the lack of applicability of the models relevant to the developed countries to the developing countries. Thus the thesis must be rather taken as a study taking the research beyond the models enumerated above.

The Capabilities framework as a basis of methodology, as enumerated by Amartya Sen and later by Martha Nussbaum has been analysed for the purpose

of getting an equitable understanding of ‘energy poverty’ in the two countries. As enumerated in the literature review section and would come to be elaborated in subsequent chapters, the social construct of a country has an immense bearing on the capabilities of individuals of a country. It varies from country to country, as well as within regions of a particular country. Amartya Sen and later Martha Nussbaum’s research and findings on the concept is expected to provide a decisive pathway towards understanding poverty from the perspective of energy in the two case countries in this research. The capabilities approach recognizes and enumerates that the development mechanism of the developing and the developed countries are different (Day et al 2016). Ignoring these differences would lead to a faulty understanding of poverty in the two sets of countries. For example, Rosie Day, Gordon Walker and Neil Simcock identify that while in developed countries the debate of energy poverty revolves around thermal comfort of housings, the debate might be actually inverse in the developing world (Day et al 2016). This study will necessarily look into the same concern. The countries of Brazil and India are largely tropical countries with fewer areas that experience prolonged cold and unbearable winters. To the contrary, in fact, these countries have hot summers and especially in the case of India for that matter, in compared to winter deaths in European countries like the United Kingdom, there are summer illnesses related to humidity and widespread occurrences of deaths due to the heat, like sunstrokes. This thesis would try to investigate if cooling, in comparison to heating is a more relevant question affecting energy access of the households in these countries.

The capabilities framework, sometimes also referred to as a perspective framework, seeks to take fuel poverty beyond the debate of merely thermal comfort and link it with the larger question of how poverty acts in the real term in the developing countries. It is pertinent thus to see how access to energy services would be tied to the socio-economic well being of households in the developing countries. The necessity thus is to set a threshold for energy linked to the human development index, a household living below which shall

be considered energy poor. The capabilities framework surmises that the aim of development programmes, in this regard policy initiatives to alleviate energy poverty should be aimed particularly at adding to an individual's capabilities rather than measuring the functioning of the individual. Focusing on capabilities shall increase an individual's options to comprehend what is his/her well being and what kind of life he/she chooses to lead (Day et al 2016). Functionings thus should be derived from capabilities and not vice versa. Amartya Sen very lucidly explains how functionings cannot work independent of capabilities. He explains that social conditions like age, social conventions, conditions and norms, most definitely influence the capabilities of an individual that goes beyond his/her income and capacity to spend the same on anything. Expenditure on energy services cannot be seen divorced from such conditions as well. Income thus cannot be a definitive indicator to suggest whether an individual is capable of freely investing in energy services or not. This argument, on the other hand, makes the measurement of qualitative capabilities very difficult. While suggesting that this thesis is essentially going to be a qualitative work, gauging the socio-political factors and indicators affecting energy poverty, the scope thus remains that it would be largely qualitative, sometimes beyond measurement. Taking the above into account, energy poverty as defined within the capabilities framework stands as 'an inability to realise essential capabilities as a direct or indirect result of insufficient access to affordable, reliable and safe energy services, and taking into account available reasonable alternative means of realizing these capabilities' (Day et al 2016).

The government policies of the two countries of India and Brazil, in this context, intending to reduce energy poverty would be minutely examined in order to understand the levels of rural electrification programmes in these two countries. These various government policies will be analysed along with the primary data collected through interviews of the stakeholders. In-depth study of policies like the Luz Para Todos in the case of Brazil and the Rajiv Gandhi Gramin Vidyutikaran Yojana in the case of India, would be done. The national

grid structure in the case countries would also be studied since their inception and subsequent development under different political regimes and policy initiatives. How their mechanisms of functioning have changed if at all, over the years, would be inspected. This would provide a wider picture of the energy gap prevalent in India and Brazil. The study would be qualitative in nature, where the human perspective of research would be enumerated. Intangible factors like social norms, socio-economic positioning of an individual, gender roles in the particular society shall be taken into consideration while investigating the levels of their access to energy services in India and Brazil. With respect to energy decision making towards energy poverty alleviation, it would be seen how social positioning of individuals affects their choices of energy. For this particular purpose, what would be especially handy is the necessity to look into census data of the two countries. The census data in any country provides crucial roadways to comprehending the social construct of the society. Also, a qualitative analysis of the census would reveal how individuals and households' social positioning affect their access to social amenities, of which energy does form an important part.

There would be detailed fieldwork, facilitating interviews with various stakeholders that would include semi-structured questionnaires targeting the stakeholders consisting of social groups in India and Brazil, especially in the rural areas in order to ascertain the basic energy needs of households. In-depth interviews of the stakeholders that include policymakers, NGO personnel, power sector experts and households will form the basis of data collection. Also, government documents will be scrutinized to understand their policy initiatives and ascertain their impact within a set time frame. Data from energy companies are expected to provide critical information on how many households consume what mix of energy service. There would be in-depth interviews of households from different social groups in India and Brazil, as well as policymakers of these two countries. Focus group interviews/discussions and interactions would particularly be decisive in the cases of individuals and social groups which appear economically vulnerable

and attempt would be made to ascertain their access to electrification and energy services.

It must be noted that the indicators of energy poverty in developing countries are different from those in developed countries. The same would thus be applied in the cases of India and Brazil. While house heating occupies an essential part in measuring energy poverty in the developing countries, it is essentially the amount or part of one's income that an individual spends in acquiring energy services is an important indicator in the developing countries. Thus in case of this research, there would be expenditure-based indicators that would be taken into consideration whereby an attempt would be made to look into the pricing of energy services in different regions of India and Brazil, so as to ascertain the percentage of one's income an individual spends on average. Secondly, access to energy would also be evaluated in terms of access to electricity in these two countries. Thus connectivity of individuals channelled through their households to the electricity grid would also serve as an important indicator towards the assessment of energy poverty. Also, it is a part of an essential debate to know what is the threshold of supply of energy to a household, below which, a household can be denoted to be living in energy poverty. In the same token, it is not a correct attempt to define the demand of a household, based on its the experiences in a particular socio-political framework, to a given frame or threshold. That would lead to the generalisation that induces faulty conceptualisation of energy poverty (Bouzarovski et al 2018). It must be noted that the consumption pattern of energy in a particular space is reliant of several other factors in the area. Thus, the attempt to generalise the experience of a developing country with another is a problem that persists in understanding the term energy poverty. Bouzarovski observes in his book in 2018 that state's attitude towards not only the distribution of energy but also the distribution of any other social security to the citizens also has an imminent effect on the energy poverty of a household. Not only is a household that is money poor is necessarily energy-poor but also their social positioning and the infrastructural situation of

the country is contributive to the consumption pattern of the household (Bouzarovski 2018). Thus, energy poverty, as viewed in this thesis is subjected not to the macroeconomic considerations of a country, but on complex imperatives that contribute to not only the supply side of the chain but also the factors that furnish modifications on the demand side of the chain as well.

Research Questions

Taking a course from the literature studies above and the methods built to suit the study, the research aims to address the following questions that emerged after the meticulous literature review explained above:

- What is energy poverty, and what role does it play in the energy security of a country?
- What is the energy poverty scenario of India and Brazil?
- How is energy poverty defined and incorporated into the energy policy making in India and Brazil?
- What is the implication of energy poverty in energy security of India and Brazil?
- What are the specific policy initiatives in Brazil and India that cater to the alleviation of energy poverty?

Hypotheses

The study has arrived at primarily two broad hypothesis which it would subsequently go on to prove. They are as follows:

Addressing energy poverty is of significant importance for an economy in meeting its national energy security goals

Energy poverty considerations have not been adequately reflected in the formulation of energy policies by governments of India and Brazil.

Theme and Subsequent Chapterisation

The second chapter of the thesis has been titled 'Factors Contributing to Energy Poverty Scenario in India'. In this chapter particularized investigation has been made to understand the energy poverty scenario in India. An attempt has been made to understand the practicalities of the energy poverty situation in India. What are the different indicators of energy poverty in India, have been enumerated. An attempt has been made to understand what are the socio-political realities of the country to comprehend the capabilities of individuals, and households (which are the units as indicators), in accessing energy services in the country. This chapter takes into consideration the particularity of India as a society as well as an economy. An attempt has been made to critically study how the capabilities framework can comprehensively be applied in the case of the country to study its energy poverty situation. How the economy of the country performs and how does it affect income as an indicator towards analysis energy poverty has been enumerated. However, income does not necessarily imply access to energy services, as has been enumerated by the capabilities framework. An attempt has been made in this chapter to ascertain other factors that contribute to the spending capacity of an individual on energy services, like the social positioning of a household that might be an impediment towards spending on energy- which might be gender, class and caste. Further, there are wide economic discrepancies between different regions of India. While creating a picture of energy poverty of the country, these discrepancies between the regions, what they are, and how they affect the well being of the population of the region in terms of access to energy has been elaborately dealt with. The National Sample Survey of India has been referred to in order has a comprehensive idea about the income capacity of households of different regions. However, as Herrero has pointed out, and has also been echoed in the works of Day et al, that these surveys conducted for an entirely different purpose might not give a complete picture of the energy poverty dynamics of the country. Even then, as a customary first step towards the basic character building of the study, a comprehensive

reading and analysis of the Census survey of India have been done to gain ground in the energy scenario of the country. At least at the level of understanding what is the expanse of connectivity of the country's households to the power grid can be deciphered from the same. There have been interviews conducted of different stakeholders both at the distribution as well as the consumer end of energy services to get an objective perspective of energy poverty in the country.

The following chapter titled 'Factors Contributing to Energy Poverty Scenario in Brazil', a circumstantiated inquiry have been made navigating around how to understand energy poverty with respect to the Brazilian scenario, simultaneous to the previous chapter. Data collected in the course of research to ascertain the level of energy poverty in Brazil have been presented and analysed in this chapter in detail. In continuation of the previous chapter, the methodology to study in an overarching manner has been different. However, there have been particularized differences in the study of this country's energy poverty scenario, keeping in mind the fact that energy poverty's definition, terms and scope vary from country to country. It must be noted right at the inception that unlike the case in India, in Brazil, the private sector is more heavily involved in production and distribution of power to a vast majority of the population. The chapter deals with this scenario very seriously. There is always a growing neoliberal debate that the involvement of private capital in most cases alleviates poverty in its economic terms, as well as creates jobs. Similarly, while equating energy poverty with the general understanding of poverty, there has been a pursuit to fathom if the involvement of private capital in power production and distribution has had any good or bad impact on the capability generation towards alleviating energy poverty in the first place. Also, the energy experts from various sectors, be they NGO personnel, or private sector stakeholders in the power sector have been interviewed for the purpose.

'Energy Policy and Institutional Mechanisms to Deal with Energy Poverty: Case of India and Brazil', the next chapter deals with the minute study of the

government energy policies of India Brazil. The functionality of the public departments in India and Brazil which deal with the distribution of energy in the country has been scrutinized. The gaps which exist in energy distribution increasing energy poverty in the country would thus have been identified. Provided that these two countries form a formidable position in the developing world, the endeavour of the chapter has been to project the practicalities of challenges of energy security in these two countries to the developing world. This chapter is instrumental in understanding how the subsequent governments of the countries have approached the issue of energy poverty in their respective contexts. While the previous chapters deal with the subjective scenario of the two countries with respect to energy poverty, this chapter tries to enumerate how the question of energy poverty has figured in the policy mechanism of the governments of this country. It has been kept in mind again that the social, political and economic composition of the two countries is very different, even while taking them to be the basis of comparison. These differences must have certain policy implications as well. That has been enumerated in this chapter. For this purpose, the political history of these two countries and how energy security has been dealt with different countries have been identified and analysed. Specifically, within the time span of the research design, an attempt has been made to deduce how energy poverty has figured in different official documents of these two countries. Drawing from the character and specifics of energy poverty in the countries in question, the impetus has been to spell out how the governments have sought to identify energy poverty in their countries and then deal with it with the intent to alleviate it. The government documents dealing with electrification programmes have been studied. For example, for the case of India, specific initiatives like the National Biomass Cook Stoves Initiative (2009), the Rajiv Gandhi Grameen Vidyutikaran Yojana (2005), etc have been studied. These documents provide an important source in mapping the mindset of the government and their intent in approaching the problem of energy poverty. The data collected from these official programmes have also been juxtaposed to the levels of implementation of the same in these two countries. Also,

essentially interviews of policymakers have been conducted to corroborate these documents and data to further elaborate on the markers of energy poverty in these two countries and the steps to alleviate the same. This information is slated to provide valuable data to be analysed and interpreted with the purpose to find the gaps in the perceptions of the government on one hand, about energy poverty and the population on the other. This has been important in reaching the findings of this thesis and substantiating the hypothesis of the thesis with respect to identifying and locating the interstice between energy need and policy initiative to satiate that need of households in the two countries.

As the title suggests, 'Implications of Energy Poverty on Energy Security: An Assessment', the following and fifth chapter, an attempt has been made to arrive at the practical problems that block the measures to alleviate energy poverty in these two countries, from the exclusive cases of India and Brazil. In this chapter thus assessment of the research has been made as to what makes the energy security scenario in India and Brazil. Drawing from the previous chapters, there would be detailed analysis as to how energy poverty has a definitive bearing on the energy security strategy of a country. This penultimate chapter would enumerate what are the comparative indices between the two countries while viewing their energy poverty scenario. With the data collected in the first two chapters that deal with the practical energy situation of the two countries on the one hand, and the data collected from the political, governmental, and private sectors involved in the energy sector sources on the other hand, this chapter has the perfect set up to elaborate a comparative study of the two countries with respect to energy poverty. This is a subjective chapter, which deals with elaboration and analysis of data already collected and spelt out in the earlier two chapters. Thus it is substantially a subjective chapter with an introspective analysis of this data. This chapter also deals with the larger question of how and where do the ambits of energy security and energy poverty overlap. This is done specifically keeping in mind the fact that we are discussing situations in developing countries where energy

security is heavily defined in the terms of the traditional understanding of security in general. However, it has been proved time and again by the recent academia that security, as it stands traditionally defined, does not necessarily follow the same loop in the developing countries where the majority of the population live in abject poverty and the question of human security arise time and again, especially now with the establishment of human development index at the international level to gauge and deal with the same. Energy poverty in this regard becomes crucial in understanding what energy security would come to be defined as. This chapter demonstrates with the facts enumerated in earlier chapters, how energy poverty must be, if not already has been, incorporated in deduction of energy security of a country. How does the case of Brazil and India elaborate this argument has been explained in this chapter.

The final Chapter is the 'Conclusion' where the hypothesis of the thesis has been tested, elaborating the inevitable links between energy security and poverty. In the same context, a detailed summarization has been made of the energy poverty scenario of India and Brazil. Through the experience of Brazil and India, what might be the lessons to be learnt regarding energy security inclusive of energy poverty, has been arrived at, for the developing part of the world. What policy initiatives that would further diversify access to energy to the citizens of developing countries is achieved at in this chapter. This chapter is incidental in summarizing the experience of this thesis. That would be incremental in forming a basis for further research in the same area.

The purpose of the research is to explain why and how energy poverty is and must form a crucial basis of understanding the well being of households and individuals in a country. With the rise of discussions surrounding unconventional security, especially in the developing regions of the world, energy security definitively forms an important part in academia. In the same context, what exactly would energy security compose of brings in the debate towards energy poverty, a perspective from the citizens. This thesis is an attempt to do the same. The objective of this thesis is to open debates that have been, until today, somewhat limited to only the developed world. While the

author recognizes the fact that she is no economist, nonetheless, it is essential to comprehend a subjective applicability of capabilities framework in the context of the developing countries to understand the expanse of energy poverty in these areas, almost completely exclusive to the experience of the developed part of the world. The pursuit is to provide a socio-political the implications of energy poverty in developing countries and their respective contexts.

Chapter 2

Factors Contributing to Energy Poverty in India

In current times, it is imperative that a country's goals to achieve development must be in concurrence with its energy policy (Dukkipati et al 2015). Energy and poverty have come to be viewed together since the week leading to the 2002 World Summit in Johannesburg on sustainable development. It has been sustained in the discussions of international academia since the early 2000s through the reports of the World Bank, United Nations Development Programme and the World Energy Council (Pachauri and Spreng 2004). Energy poverty, in that context, is a term that can be defined in a multifarious form that includes diverse approach. The width of the term can be elucidated keeping in mind several factors and indicators, and scholars are yet to come to a definitive conclusion and synergy as to what might be the objective interpretation of the term. The discussion regarding the concept customarily includes the incorporation of the idea of access to energy by people and households. On the other hand, the amplitude of this design might include the empirical study of both connection to the energy grid (Pachauri and Spreng 2004, Pachari et al 2004, Cheng and Urpelainen 2014), as well as the concept of affordability of this access (Winkler et al 2011, Alkon et al 2016). This chapter would try to look into all the possible factors that contribute to understanding and evaluating energy poverty, in the case of India, from a socio-political perspective. The impetus of this chapter is to make an attempt to understand the modalities of energy poverty in terms of the developing country of India. The pursuit would be to create an episode in the study so as to eventually lead to assimilating the concept of energy poverty within the premise of energy security at the level of domestic policy in the following chapters to come.

Energy Access and Energy Poverty in India

While negotiating the modalities of access to energy, energy security at the domestic level has always been approached from the perspective of the state, and subsequent infrastructure associated output related debates. Somehow the same debate has been neglected to generate traction from the context of the consumers of energy, that is the people of a country (Balachandra 2011). Thus to assume that a mere mention of energy access in the development policy of a country without assessing the energy needs of its population is not enough. The linkage between energy and poverty while discerning the modalities of the width of human security, for that matter, has been established in the past few decades by the academia (Bhide and Monroy 2010).

Energy poverty in most cases is identified with the access of households to modern fuels, which in turn intends to be the unit of discussion in this study. When the inquiry into the concept of energy poverty started, especially in the UK, it emerged in the form of a study to understand fuel poverty, in the 1970s (Boardman 1991). The fundamental basis of enumerating fuel poverty in the pilot study was to equate the lack of access to affordable and sustainable fuel services in the lower-income households of UK with their poverty, leading to them unable to pay for sufficient insulation of households in order to cope with the winters. Thus, the lack of energy efficiency of houses was the idea that gave rise to the concept of fuel poverty in the lower-income households of developed countries like the UK. It was recognised in this study that the contemporary global rise in the prices of fuel has made the consumers unable to meet their basic fuel needs, especially in order to maintain the warmth of their households during scathing winters (Grey et al 2017). However, with the passage of time, the meaning of energy poverty went beyond both the limitations of the finances of households of study as primary factors of fuel poverty as well as looking at the necessity to maintain only the warmth of households only as a universal factor contributing to fuel gaps. To begin with, the energy efficiency of homes itself means different for different places of the world, as has already been mentioned at the beginning of the thesis. Energy

poverty as meant by households have come to be understood in varied terms today.

In the same token, on the other hand, it must be kept in mind that different households have varied necessities towards sustainable energy security. This has a definitive impact on the interpretation of energy poverty. For example, how much a household spends on accessing energy also leads to the rationale behind understanding the method to discern the particularities of the concept. This insight leads to the interpretation in terms of the understanding, for instance, that in some cases the household in all probability, while facing energy poverty, is spending more than it is supposed to in obtaining energy and in the process is having to let go of many other household necessities at the cost of the same. In the same token, when a household spends less in accessing modern fuel, it might also mean that households do not find it viable to spend on modern fuel, even while it is available, which in turn might site the problem again at the affordability factor towards accessing energy (electricity in this case of study) (Alkon et al 2016). The question in the latter case is then what makes access to energy viable or feasible to the consumer, whereby they can both have access to affordable energy besides not having to prioritize this admittance over access to other necessities of sustenance. In those circumstances, it must be kept in mind that it is not always the increase in energy prices that propels the consumer to disconnect from the power grid. It might very well be so that the price of access to energy has been constant for several years over the time period in question. In that case, a flip-side view of the problem is necessary for analysis to interpret energy gap leading to the problems of energy poverty. Even while the price of accessing energy might not increase when the cost of other necessities in a household increases, the share of expenditure on energy also increases automatically exerting pressure in a household budget and might prioritize accessing other necessities of the household over energy access (Alkon et al 2016). Also, it has been perceived that a household might choose to continue to use traditional, non-conventional sources of energy, over access to electricity if the latter is recognized to be

expensive in the light of the availability of the former, which in turn might be understood to be inexpensive in comparison, however unsustainable it might seem (Bhide and Monroy 2010). Thus at the policy level, the task remains with the government to encourage more connection of households with the electricity grid by making it lucrative and seem to be a natural choice over traditional energy options.

The timeline to be studied in this thesis is 2006 to 2015. Also, first and foremost while describing energy poverty, an economic term in academia, the stimulus would be towards looking into the economic considerations that determine the term or contribute towards determining the term. Total electricity generation in India as per the International Energy Agency from 2006 to 2015 has increased from 773784-gigawatt hours (GWh) to 1383004, nearly doubling in the process (International Energy Agency). However, this study embarks to verify if an increase in total electricity generation actually translates into an increase in access to energy by households in a country. Factors to look for in that case would be not only to find out if households of the country are connected to the electricity grid that registers such monumental growth in energy production but also to ascertain if the tariff rates of electricity, as provided to the households, is affordable by the citizens of the country. Whether a household has to spend a considerable amount of its income on accessing electricity is but an important concern to take into consideration in order to determine energy poverty, albeit in the face of a significant increase in production of energy in the country. Access to energy by households is not enumerated merely by connection to the mainstream electricity grid in a country. The UK Department of Trade and Industry (DTI) defines unaffordability of energy by fuel poor households as such if they have to spend more than 10 percent of its income in energy (Winkler et al 2011). This might vary keeping in mind the fact of the size of households in question. Further, the amount of energy a household spends also depends on the climatic condition of the household in question. This study thus tries to understand these modalities and their practical applicability in the context of India.

Correlation of Energy Consumption Patterns and Expense in India

India is the world's third-largest producer and fourth-largest consumer of electricity as per BP Statistical Review 2017. As per the same report, the energy consumption of India has catapulted by 5.6 per cent in the year 2016 (BP Statistical Review 2017). Yet, Energy expenditure by households in India on the other hand touches the mean of 13.2 percent as per the 66th National Sample Survey statistics, well above the 10 per cent expenditure cap as specified by scholars by developed countries' levels with the burden of energy cost to be the highest in households with lower income (NSS 2015) (Alkon et al 2016). This clearly highlights the energy poverty or rather the energy gap existing in Indian households that need to be delved into. It points out that while India as a growing nation does feature into the global energy map acknowledged by its thriving energy consumption markers, when the focus shifts to the Indian households, the picture changes drastically.

The 68th round of National Sample Survey (NSS) data collected between the years 2011 and 2012, it has been found that even very much to the present about more than half the rural population carry on with the use of wood chips and firewood as their source of energy for cooking. Data collected in 2005 suggests that 364 million of the rural populations in India, out of 809 million lack access to electricity sources (NSS 2006). The preeminent choice of fuel in these rural households have been cow dung, wood chips and kerosene. As per a study made in 2010, there had been a negligible shift of the rural households towards modern and more sustainable sources of energy like oil, or electricity, though it is understood that it is in the rise (Bhide and Monroy 2010). On the other hand, it is perceived that about 625 million people continued to use traditional fuel to meet their energy needs (Bhide and Monroy 2010). This detail does not however articulate if this significant section forms a part of only the rural population, or overlap into the growing urban population of the country. If the latter is true, then it must be a matter of escalated concern given it is always perceived that it is the rural population, who are at the receiving end of poverty margins, who feature at the bottom when it comes to energy

poverty as well. This widens the scope of energy poverty from being limited to the rural population of the country. Rather, the urban poor, who might be still choosing traditional energy sources over access to more sustainable sources like electricity must also be brought under the ambit of the study.

It is, in fact, interesting to study if the income poor are also energy poor in India. While on the surface economic development of a country is reflected also in increased energy consumption of that country. For example in the period between 2000 to 2007 electricity consumption of India increased by 60 per cent mirroring the 77 per cent growth in the Indian economy (Khandker et al 2010). As per the 2005 household survey, while 22 per cent of households in rural areas in India are income poor, some 57 per cent of them are energy poor. For urban areas on the other hand while 20 percent of the population is income poor 28 percent of them appear to be energy poor (Khandker et al 2010). This challenges the idea that those who are facing economic poverty also face fuel poverty. On the other hand, it can be not very far fetched to claim that energy poverty is not always dependent on the income status of a household. This widens the understanding of energy poverty as a concept contributing to the understanding that economic development does not always alleviate energy poverty conditions of a country. Also while LPG use has increased in rural India, the major consumption pattern of households suggests that they still depend heavily on Biomass consumption. Thus with the increase in income almost invariably energy consumption of a rural household increases over a period of time. However similar is not the case in an urban household. With an increase in income in an urban household it is interesting to observe that there is a transition from the use of traditional fuels to a modern mix of energy consumption. This modern fuel is often more expensive than traditional fuel (Khandker et al 2010).

Also how and for what purpose energy is used varies extensively between rural and urban households. What determines the choice of particular energy must be subjected to enquiry in order to understand energy poverty as well (Pachauri and Spreng 2004). It has been founded by studies that households in

India prefer to use a mix of multiple fuels while catering to their energy needs, be there in a rural area or in an urban area (Pachauri and Spreng 2004). A complete switching from a particular mix of fuel to another source of fuel is in fact rather avoided by households. While rural households predominantly use energy for the purpose of lighting and cooking, energy in urban households is used for various other reasons. The character of energy used also have an important bearing in the purpose for which energy is used in a household especially while understanding the difference between rural and urban households. While kerosene is used predominantly in a rural household for lighting purposes in urban household electricity is majorly used for multiple uses. Even while the use of LPG has increased in rural households, the use of wood chips and cow dung or other biofuel sources is predominant for the purpose of cooking in rural households. On the other hand, electricity has an overarching presence in the energy mix of an urban household where it is not only used for lighting purposes but also for making available many other modern utilities to an urban household. This is an important dimension to the availability of energy and the character of energy in a rural household and an urban household in India. With less availability of electricity in a rural household, the choice of energy is quite limited which is why kerosene seems to be the only option for lighting in such households, in the absence of electricity. It also must be kept in mind that Biomass and biofuels and traditional sources of other fuels have much less efficient than LPG or electricity making the rural households actually spend more fuel in comparison to urban households which are using less electricity to attend similar ends (Khandker et al 2010). Thus the efficiency of the character of fuel used is essential in understanding energy poverty and its character in different phases of society from underdevelopment to development as well as in different areas of society, rural and urban. Hence it can be comfortably deduced that energy poverty rapidly reduces with the increase in the use of modern forms of energy like electricity.

Why a particular mix of fuel is used or a choice of a particular type of fuel is made by a household, can not always be determined unilaterally. Neither can it be deduced that the choice of a particular kind of oil is determined only through economic factors. As Pachauri and Spreng found out in their study that the choice might be determined on factors of affordability, that is, the cost of the energy service, cultural or social preferences, literacy, while sometimes it might be determined by security concerns relating to the supply of a particular or varied types of resources available (Pachauri and Spreng 2004). Even while the cost of fuel is determined by the time and labour involved in collecting the fuel, sometimes households would overlook that and determine their preferences based on the easy availability of the fuel source. For example, wood chips are more readily available in rural areas. The rural population do not generally have to pay a price to collect woods. Even while there is intense labour involved in collecting wood, to use it for fuel purposes, the inexpensive nature of the wood collected to act as an incentive to the rural households in terms of preference and use. Similarly, the availability and the cost of possessing a stove to burn the wood is almost negligible, giving the rural population of India, the incentive to use wood as their primary source of energy in households in terms of cooking over any other source which might include higher costs like buying an LPG stove. However, if one adds the labour cost of attaining wood for the same purpose, then the expense incurred in accessing this particular source of energy would be, if not remarkably increase to modern sources of energy like electricity, but at least considerably increase to its earlier status of being inexpensive, at best (Pachauri and Spreng 2004).

Studies in case of India suggest contrary to the examination of similar conditions in other countries, as suggested by scholars (Masera et al 2000), that the transition from inefficient traditional fuels to more efficient sustainable and modern fuels is not a unidirectional process (Pachauri and Spreng 2004). Households in India, be it rural or urban, tend to use multiple mixes of fuels or energy to meet their energy needs. Fuels like coal thus have

been noted to be of a transitionary character. While the rural population of the country use a greater mix of these transitory fuels, urban population use a lesser fraction of the same in their energy mix (Pachauri and Jiang 2008). Since the population in the urban areas of India are denser in character, it is easier to connect them to the central electricity grid. Easier in this context must be taken in terms of being easier in reach to the grid, and thus cheaper in the distribution of energy. Rural India, for that matter, is still characterised by a dispersed population density. This makes it difficult for the central electricity grid to access households more efficiently. Connecting rural households is more expensive in character thus. Also, the financial capacity in general terms of the population in urban areas is more compared to the rural areas. Which is why it must be understood that they have better spending capacity as well as better option to invest in more expensive modern modes of accessing energy (electricity in this case), than the rural population, which in turn prefers traditional options of accessing fuel (Bhide and Monroy 2010).

Territory and Regional Disparity Contributing to Energy Poverty in India

Regional disparities in development also contribute to increasing and invigorating the energy poverty debate. As per a study by Alkon, Harish and Urpelainen in 2016 prove, the burden of expanded energy prices is felt by rural areas more than in urban areas. It has been confirmed by the study that even while energy burden is higher in some state (regions) in India than in some other regions, even in those cases the burden of energy prices weigh heavier on the rural population of the country more than it is felt by the urban population in the same region (Alkon et at 2016). The study also points out that even while access to modern fuel options have increased over the time in the case of India, enumerated by say only 31 percent of the households in the country having connection to the electricity grid in 1987, compared to around 73 percent of households having access to electricity, the energy cost burden over the rural population of the country has also gone on to increase, thanks to energy inflation over the years (the study spans from 1987 to 2010) (Alkon et

at 2016). The study also points out that the burden of energy cost weighs heavy on certain regions more than on others. States of India that have better wealth index like Tamil Nadu or Kerala have better access to energy than other regions with poorer development index like Bihar and Uttar Pradesh (Alkon et at 2016). The northern states of India, which had been positively affected by the Green Revolution, like Himachal Pradesh, Uttaranchal and Punjab, faceless energy gap especially in the rural areas of the states (Khandker et al 2010).

The character of the access of people to energy is also affected by the topography of the country. For example, the state of the country which is closer to the coal-producing belt of the country, have better access to coal as a fuel source. States like Bihar and West Bengal fall in this category. At the same time, the regions of the country which have difficult terrain in terms of, for example, being mountainous or having other varied inhospitable conditions, as the North-Eastern part of India, face difficulty in being connected with the central electricity grid of the country. For the latter, for example, the region has been termed to be 'energy starved' (Borah 2007), even while having a plethora of natural energy resources like, upper riparian, swift river systems; wind power with the potential of about 300 to 500 megawatts of production capacity even at lower heights of 50 to 80 meters (Ministry of New and Renewable Energy Annual Report 2016-2017); also, coal, oil and gas for thermal power generation as well, which remain untapped for several reasons. It is indeed an irony that while this region ranks quite high in the production capability of electricity, while it comes to energy consumption patterns, it has featured pretty low. About 97% of the hydropower potential of North East India is yet to be harnessed (Das 2013). The paradox also remains in the testimonies that point towards the energy deficit of the region so much so that they have to purchase a lump sum amount of energy from other states (Borah 2007). About 53 per cent of the population living in northeastern India do not have access to electricity (Centre for Science and Environment 2016-2017). The situation varies in different states

of the region, with Mizoram fairing the best with 84 percent of the population having access to electricity, while only 37 percent of Assam, on the other hand, have access to electricity for lighting (NSS 2011, Centre for Science and Environment 2016-2017).

The topography of the region has been slated to be the main hindrance in both productions, generation as well as the distribution of energy in the region. Even electrification programmes like the popular Deendayal Upadhyay Gram Jyoti Yojana (DDUGJY) have only partially solved the problem as of yet. The rate of Electrification of the states of Northeast India is considerably lower than the national average of about 84.3 per cent (Das 2013). Shocking figures like electrification of fewer than 500 villages in about 4 states of Manipur, Mizoram, Nagaland, Tripura can only prove the extent of difficulty of the situation at hand for the Indian government at the policy level. There are success stories from sections of the region like Arunachal having the largest share of about 40 percent of its electricity source being garnered from renewable sources, and 38 percent from hydropower sources, even while about only 66 percent of the population of the state being connected to electricity (NSS 2011, CEA Executive Summary 2016) making it about 30000 people having no access to electricity; Meghalaya having 70 percent of its population receiving electricity from Hydroelectric power sources. The situation is worse in states like Assam which have the highest density of population among all the other states of northeast India with heavy dependence on fossil fuels. Manipur, on the other hand, shows a transitory character, where 33 percent of the population use gas as their primary source of fuel and 39 per cent of the population drawing its electricity from hydroelectric sources (CEA Executive Summary 2016).

Access in general to the region of northeast India has been problematized by the topography of the region which poses a serious problem for the Indian government as well. Scholars believe connectivity to this region have been cut off by the partition of India with major Railway links running through Bangladesh (Das 2013). The population residing in this region face serious

problems in terms of connectivity even now and are underdeveloped in several other terms, as poor infrastructure, also for the same reason. This region is characterized by torrential monsoon followed by floods and landslides. Also, the region is categorised to be one of the most active seismic regions of the world (Das 2013). Further 60% of the geographical area of North East is under forest cover which is rich in biodiversity. This becomes an important consideration while making decisions for big installations towards the generation of electricity in this region, like the construction of dams for example. Disputes emanating from water sharing between India and its neighbouring countries also pose a serious problem in the installation of dams over rivers which are shared by other neighbouring countries of India as well (Das 2013). Connectivity of the region to the central electricity grid is also a problem given the construction of connectivity lines over a considerable distance, especially through a small land corridor that connects this region with the rest of India, making the process more expensive than it would be for any other part of India. These reasons compositely make up for enough reason to pose serious concerns towards both the development of the renewable energy potential of India, as well as in general connecting the region to the central electricity grid of the country.

While statistics prove that there is some obvious reduction in the situation at present, even than around 240 million people in India lack access to clean and sustainable energy (Hunink 2017). Around 86 per cent of the rural population and 20 percent of the urban households still rely on solid Biomass as a primary source of energy (Jewitt and Raman 2017). This is where the catch lies, while studies (Alkon et at 2016) might reveal that the correlation between a household spending on energy has been stable over three decades from the 1980s to 2010s, the idea that universal access to electricity and other sources of modern energy, even while involving the private sector in the distribution of electricity is erring in ways more than one. This is where the hook to identify energy poverty lies in the context of India. Also, this study believes that since as proposed by Alkon et al in their study that households, rural

included would be more willing to pay higher expenses on energy if they have access to the electricity grid or have access to modern fuels, to begin with, appear flawed. This approach dilutes the case of affordability of energy access, in turn, mitigate the circumstance to objectively identify the nuances of gathering the scope of energy poverty in the case of developing countries like India. This study considers access to modern fuel options in the form of connection to the electricity grid as well as the price which a household must consider to let go of to access it. In this thesis, in subsequent chapters, it would be clearer how policy initiatives at the level of the government of India have till now sought to review and remedy this issue as well as how far it has succeeded in the same.

It can be said with utmost certainty that the government of India does not, at present, at any cost, ignore to identify the necessary access to energy inserts on the development of the country and its populations in general. Several energy-related policy-level discussions, as well as interventions, have made it amply clear that the intention of the political elite of the country is definitely towards mitigating the problem of the gaping energy gap amidst the population of the country. There has been a significant shift in the outlook at the policy level to consider energy from not only the perspective of consumption but also envision it from the mindset of being ‘need-oriented’ (Jewitt and Raman 2017). Prayas Energy Group, an NGO based in the city of Pune, India, annually has done a systematic study of the electricity legislation of the country that might give thoughtful insight into the mechanisms with which electricity is distributed in the country and the problems, if all with the process. The technicality of the process, essentially a top-down approach, given the context of the distribution of energy from the producer to the consumer, shall be dealt with in detail in the 4th chapter of the thesis. However, in this chapter, just to provide a context to the scenario that contributes to energy poverty, it must be a decisive task to look into some excerpts of the same.

The Subsidy Regime and Cost of Power

Subsidy to the energy sector to make energy accessible to the poorest of the population has been a historical tradition of the Indian government. In Modern times, subsidies are also provided to transition fuel to make the population susceptible to evolution from traditional fuel practices to modern energy mix **(**Cecelski 2000**).** The energy sector in India in general, and the electricity disbursement sector of the country in particular is largely a public sector, where the involvement of the government plays an important role in mitigating the heavy costs in the production of electricity, while distributing the same to the consumers, via control of tariff rates, issuance of subsidies to consumers to help them choose more sustainable sources of the same over traditional, inefficient ones, and incurrence of surcharges to the DISCOMs doing the distribution on behalf of the government authorities. In more recent times, the surcharging of the DISCOMs have been undertaken under the directive of the Financial Restructuring Plan (FRP) of 2012, the Ujjwal Discom Assurance Yojana (UDAY) of 2015 and the 2016 Amendment of the National Tariff Policy (Josey et al 2017). It has been found that in Indian states, DISCOMs have been compelled to a significant amount of uncontrollable extra costs involved in distribution of electricity, be it for the reason of change (read raise) in primary fuel prices, raise in price of transportation of the fuel, change in the rates of taxes, etc, through increase in tariff rates by 7 to 25 percent from the consumers of electricity (Josey et al 2017). This phenomenon persists in the majority of states in the country, whereby the cost over and above distribution of electricity is gathered from the customers annually, which they often have to pay retrospectively. The surcharge is revised in India typically on a quarterly basis, even while it is levied on the electricity of the consumer on a monthly basis. The main problem with the levying of such massive surcharge has not only definitely everything to do with the massive disparity between what the consumer was supposed to pay as rate of accessing electricity at the beginning of the term but also with respect to how much transparency is undertaken while determining

and applying these surcharges with almost negligent involvement of the consumer, that is the public in the process of determination of this price (Josey et al 2017). There is an urgent need to increase the credibility of the electricity authorities and the intention of the government of the country and the states of the country to be particular, through more transparent national legislation for the same purpose. The state electricity regulatory bodies must show this intent through processes that increase the participation of the public, as well as include those costs in the surcharge that is absolutely unavoidable and encourage the government to step up with financial respites to the consumers wherever possible. These can be done through measures like letting go of the costs like penalties for deferred payment of charges, which is already in practice in some states of the country like Andhra Pradesh and Bihar; keeping in mind the fuel subsidy given to the poor households and customers, for the consumers to pay included in the surcharge (Josey et al 2017).

Problems in governing the distributing companies (DISCOMs) that distribute power to Indian households, especially in the rural areas are complicated. The interaction between these DISCOMs is often guided by extra-governmental manners. It must be kept in mind that these DISCOMs are in most cases private entities with profit motives of their own, encouraged to participate in the distribution of electricity by subsidies provided by the state governments that they operate under. Often interaction between two or more DISCOMs is governed by economic rivalry, market considerations, or strained relations based on the states they perform on behalf of. Telangana, for example, is a state that has been newly formed in India, breaking up Andhra Pradesh. The two states since have had a strained relationship with each other, whereby, the DISCOMs under them, even while they have opportunities to collaborate, resulting into financial respite to the customers of power, in the form of tariff relief, has often chosen to ignore that. In the time period of 2017-18, power-sharing between Andhra Pradesh DISCOMs to Telangana DISCOMs have seen certain disruptions. Similarly, even with the availability of surplus power, they have refused to purchase the same from each other in cheaper

rates, even while it has led the DISCOMs with the need for surplus power to acquire the same from other DISCOMs at higher rates established by the market (Rao 2017).

These problems contribute to the increase in the cost of power, leading to complications in both affordability as well as the accessibility of electricity to the consumers of the country. Regulation of tariff rates for the government of this country is rather delegated to the state authorities of the country. Even while there are national central regulatory boards for determining the cost of fuel, for example, to generate electricity, the ultimate determination of cost of electricity is done by the state electricity boards or commissions of the country. While it is majorly the forte of the central government of India to make energy installations across the country, connect towns, cities and villages to the electricity grid, it is the responsibility of the state authorities to decide the tariff rates of distribution of electricity and power. That might have several positive features, however, decentralisation does have some very practical problems as well, especially while it contributes to the tariff rates of electricity. Firstly, it is the state governments which enters into interactions with private entities to run DISCOMs at the state level. It is their responsibility to regulate the performance of these DISCOMs, determining what is going to be the cost of power to be incurred by the consumers and their households. While the price of fuel remains the same across the country, the fee for transportation of the same from one part of the country to another differs, based on the location of the countries. This is one major reason for differences in the price of electricity across states in the country. There are states which do not produce energy of its own. These states have to import energy from other states to satiate their energy needs. However, the farthest the state that they import their energy from, the larger would be the cost of inculcation of energy to its consumers (Sudeep 2017). This is an inbuilt fallacy of the energy sector of the country. Further, there is private power producing entities in some cities that enjoy almost a monopoly over the electricity consumption markets of the cities, due to the lack of any other competition in the market. A case must be

cited for the state of West Bengal, where CESC, the Calcutta Electric Supply Corporation, private electricity generating and distributing entity run by the RPG Group enjoys an almost unchallenged monopoly of the market of the state since the 1970s over Kolkata. This has led to a somewhat unhealthy, unhindered process of unquestioned increase in the tariff rates of electricity distributed in the city, whereby even while West Bengal falling in the traditional energy-rich, coal-producing belt of the country, has seen a rapid increase in per unit cost of electricity being dispersed to the households. Moreover, the West Bengal Electricity Regulatory Commission has given undue advantage to the licensees of power supply by giving them 0.25 per cent of their gross assets as exigencies or difficulties unforeseen, making the consumers pay charges to access electricity that they are not supposed to pay in the first place (Choudhury 2017). There is this huge disparity in the tariff rates of power given to households of different states of the country.

The Role of Decentralisation in Eradicating Energy Poverty

Decentralization of energy distribution, that is providing access to the population of the country has time and again been proclaimed to be solved by connection to microgrid operations. Most of these solutions are in fact provided by private energy providers. However, what needs to be kept in mind is the fact that these microgrid operators are private entities that administer this energy access, especially to areas which are remotely located and rural in character. The situation is such that these microgrid operations, since providing energy to a section of the population with not very high spending capacity, despite being run by private operators, consequently are loss-making (Hunink 2017). Thus there is no incentive to private entities to enter in the energy distribution process. The argument that there needs to be more decentralization in energy distribution, in terms of privatizing a section of the sector, fails to stand. This thesis would deal in detail with political interventions at the level of the government to deal with increasing energy access abbreviating energy poverty of India in the following chapter. The

possible respite lies on more reasonable and sustainable tactics introduced by the public sector in the domestic energy policy of the country.

This study tries to argue that at the policy level the push must be devised to build a sustainable apparatus which encourages larger participation of the community that is to be integrated into the grid, be it through off-grid strategies, through means that do not further discourage them from this connectivity. The line of reasoning that tries to push private sector involvement in the energy sector essentially look at it from the perspective of it being a market, that essentially needs to be monetised in order to be viable in the first place. That argument fails to address the concerns of the people and the households that the process would be further alienating towards the citizens and fails to sync the idea of energy security with energy poverty, a study from the perspective of the citizens. The involvement of private concerns ignoring the inevitable rise of price of energy, manifesting through higher tariff rates than the contemporary shall only do a disservice to the very point of access to energy that 'consumers' are intending towards, rather than addressing energy poverty concerns, substantially because private entities are typically propelled through profit-making motives, even at the cost of any other viable concerns that might arise. This chapter, in that case, has already argued that the tariff rates of access to energy are of great repercussions on the debate around energy poverty. This is essential because the affordability factor of the debate cannot be alienated from energy poverty. Energy poverty cannot be understood if access to energy is viewed in isolation and not in combination with the affordability of energy in concern.

The Classification of Society and Access to Energy

Even while economic terms essentially cannot be ignored while formulating the definition of energy poverty and demarcating its modalities, one cannot ignore social factors like class, gender and especially caste in the context of India, that donates to its definition. This is where the capabilities framework come in handy in understanding the nuances of the debate of the issue. It must

be noted that the size of a household, gender of the head of the household, age of the head of the household who makes energy practices and choices, also determine and have considerable bearing on the energy choice of the particular household as well as energy poverty experience of the household (Alkon et al 2016). While one tries to analyse energy poverty through the perspective of capabilities framework, it is essential to understand that energy, in such regards, must be viewed from the perspective of a service that is incidental in contributing to human freedom, expressed in terms of contributing to human productivity reflected through labour, healthcare, job creation etc (Mahat undated).

In terms of gendered perspective over the access to electricity, there is considerable unavailability of sources to study in the matter. It would be only an educated understanding that gender of a consumer has a considerable impact on the decision made by the household. The way a male head of a household decides on the allocation of budget to access various resources for the sustenance of household might in all probability differ from the way a female head of a similar household would. Poor households often have a gendered character to it that is often, on the other hand, either ignored or isolated, and to some extent, even invisibilized. There is the existence of a large number of households in developing countries that are headed by a female (Cecelski 2000). Their position as the head of the family makes it essential for them to appropriate energy as well as manage the distribution of energy within the household. There is however great ambiguity in ascertaining that detail most of the facts and data available on household expenditure on energy, for that matter, as well, especially when the study is on determining energy poverty, based on gender preferences. While applying the capabilities approach to the study, it is only pertaining that gender nuances are also kept in mind while determining the capability of a household which might have a definitive impact on energy poverty of a household in particular and the country in projection.

Many studies have deduced that rural electrification in many cases has benefited the higher income populations than the lower-income ones (Barnes 1988, Cecelski 2000). In the same token can it be concluded that every developmental project faces the same pitfall. In other words, the social differences between sections of populations in society have its bearing on how development is accessed by these different sections. In the same token, While taking a gender perspective to energy poverty, considering energy to be a definitive marker of development, the question remains if it can be proved similarly that a gender which has been discriminated historically, also face similar discrimination when accessing affordable and sustainable sources of energy. There is however a lack of empirical study which has taken an objective position on understanding this phenomenon in detail. It is a given that India is a country which has divisions in society based on several discriminatory practices, be in gender, class or caste. If it is proven that economic disparity has been the basis of denying access to energy, be it in the forms of restricting access to electrification, there can be no reason why access to affordable energy might also be restricted based on other social forms of discrimination as well. Poverty faced by a man and poverty faced by women is different in nature and character. Men and women, for example, do not have access to similar credit facilities (Cecelski 2000). Similarly, men and women in society are not perceived similarly, in a developing country especially, like India. In traditional society is like India for example cooking is still a practice which is predominantly performed by women in the household. It is already thus understood clearly how hazards from using biofuels affect women more directly than men in a household. Similarly there social access is dissimilar and discriminatory in fashion. Ignoring such perspectives in understanding poverty and energy poverty, for that matter, contributes to the overlooking of effective means of making energy access compelling to the distressed sections of the population, diluting the very essence of the concept. Thus there should be a gender perspective in policy formulation which caters to energy distribution among the masses, including the pricing of energy. There is the need to incorporate gender as an important determinant while designing

energy project and based on that, what field methods and analytical tools must be used should be determined (Cecelski 2000). Rural electrification, thus, from the perspective of a more nuanced gender viewpoint, must take into consideration several factors, like whether electricity would be successful in reducing labour of a woman in collection of water by energizing water pumping, whether electricity would reduce the time spent in cooking, reduce her time spent on agriculture or agricultural activities, reduce labour and increase her leisure activities, in the process considerably increasing her productivity, and subsequently her capability (Cecelski 2000).

There is thus a very urgent need to bring in a change in the rural electrification program or for that matter any energy policy of the country, both at the national level as well at the state level. Though India has tried to do its best in terms of increasing the number of villages connected to the electricity grid, the problem remains as to how many times this connectivity of villages have transformed into the connectivity of each and every household of the village in the electricity grid. Further, the voltages of power supply have proved to be faulty in most cases. Even while the number of villages connected to the grid has considerably increased in the past decade or so, the voltage of power supply has continued to dwindle. There is serious concern regarding the variation in the rates at which electricity is distributed across the states of India. Depending on where the household of a consumer is located, the tariff rates vary heavily. Further, these tariff rate imposition has been time and again questioned depending on the transparency of the entire mechanism of its performance. The increase in power tariffs in many states are despite the prevalence of technical problems of maintenance of power distribution mechanisms in the country in general and the states in particular, reflected through defective meters, non-replacement of either faulty or non-performing transformers, low voltage of the power supply, etc.

Conclusion

How to view energy in the discourse of development of a country has been the main area where the study around energy security has lacked nuance in the debate. It has been a continual struggle to conceptualise energy as a service that fundamentally acts as an enabler in an individual's development. Energy has been traditionally viewed as an input factor in the development of a country, in the form of the fuel required to achieve a certain end of economic development. However, the capabilities framework essentially tries to view energy as an output, as a service that contributes to the provision of a regular security building in the lives of individuals and their families. Especially in the context of countries that are yet to achieve the developmental goals of sustenance and stability of the economy, the contribution of energy is not only as an enabler to the economy but also as a factor that helps groom the lives of consumers at an individual level. Thus, viewing energy poverty as a concept that ties it to the income and share of expenditure of households on fuel is a generic view that overlooks several factors that might have an implication on the concept. To equate energy poverty with economic parameters of a country gives an overall macro understanding of energy as an input to society. As has been explained in the chapter, it is rather insufficient to gauge energy in terms of the income of households and individuals. While it is true that the income-poor find it difficult to access energy, it is only when energy is viewed from the perspective of access do we better or clearly understand the impact of energy in the daily lives of individuals. Similarly, the fact that recent academia has started to take the sustainability factor of energy into the study of energy poverty is something that brings an unforeseen nuance into the study of the concept. Again, while the income poor might find it difficult to carve out the right share of their income for the access to energy, in developing countries, they might eliminate the cost of this access altogether by opting to find and burn easily available fossil fuel to achieve their energy goals. In those cases, while the immediate energy gap is met, fuel remains unsustainable and has an attached environmental cost to it. Thus, what is to be made of the concept of

energy poverty at the global level or at the levels of the developed part of the world is very different from what it means at the level of the developing countries of the world. Drawing from this, it is but incremental to understand that the nuances to energy poverty in India have more layers than generally understood at the global level.

Energy poverty, thus, in the case of India is not a mere matter of the availability of power, electricity or fuel for that matter, but also the charge at which energy is made available in the country to its households. There is a systematic lack of uniform mechanisms to make the determining factors of energy poverty go away. This is because of several factors. While the possibilities of the generation of electricity through renewable channels bring forth a promise to the future of India's energy sector, there are still considerable roadblocks to deliberate on, regarding the same. India does not lack behind in the production capacity of renewables. The mere expanse of the country, differential topography, climate, and also political exigencies need to be considered to make the issue at hand possible with regards to renewables more viable to the country. Rigid bureaucratic mechanisms to deal with technical problems like the replacement of transformers for existing electricity grids itself complicate the matter. Often the Indian Electricity Act of 2003 has been heralded by scholars to be a mechanism through which there has been thorough encouragement of privatisation of the sector in the country, as a consequence to which private, profit-making entities have functioned through unregulated hike in electricity tariffs diluting government's control of the sector (Choudhury 2017).

If there is a lack of seriousness in maintaining the order of the already established electricity programme, what can be expected to be accountability and transparency at which power shall be encouraged to be dispersed through renewable sources gather serious doubts? Open access mechanisms on the other hand, whereby private participation in the production and distribution of energy, on the other hand, does more negative than positive to the energy poverty scenario of the country. Energy poverty in the case of India, thus, is a

scenario that is multifarious. There are several factors that need to be kept in mind while calculating the probabilities and modalities of the concept. It is neither unidimensional nor thus can the approach to the solution of the problem be provided in a peripheral manner. There has to be a thorough intake of all the problems of the situation from the grassroots level to the national level. It must be kept in mind that the problems of bureaucracy contribute to energy poverty as much as the surge in tariff rates of the end product. Adjustment and regulation have to be brought in at every level to counter the reality of energy poverty in India.

Chapter 3

Factors Contributing to Energy Poverty in Brazil

While studying the energy poverty scenario of Brazil, this thesis would focus on the extent of electrification of various regions of Brazil, discovering the various factors and features that have, over the years, affected access of consumers to the same, aiding or hindering it in the process. The overall diagnosis of the situation involving energy factors and resources have been looked into, as far as it affects the electricity grid of the country, it's functioning, the production of electricity and its distribution to the consumers. It is critical that every contributing factor to the functioning of the electricity sector of the country is looked into in detail to locate and understand energy poverty and its socio-political impact on the energy security of a country and its citizens. The question that needs to be reiterated in academia is not to limit itself while dealing with the scope of energy security to 'security' itself but to equate it in association with energy equity, and energy sustainability. The necessity is to investigate and challenge the prevalent idea of 'security' itself. For, energy security cannot be appreciated in isolation from the other two, which is crucial in gauging its efficacy and practical credibility and capability affecting the daily lives of people and communities and their choices in development.

Brazil as a country has, in the current years, emerged to be an important example of clean and sustainable energy mix, especially considering its heavy reliance on hydropower and the use of biofuels in the transportation sector, also considering the huge levels of almost 253,422,000 tonnes of oil consumption by the year 2012 (Swedish Agency for Growth Policy Analysis Report 2013). This is an incredible feat, worth replicating in other large economies, if possible. This is especially because the energy sector of Brazil projects an interesting anomaly. The share of renewables that the country employs to provide energy security to its economy is large compared to

international levels, especially at the level of generating and providing electricity to its population (almost 80 per cent of Brazil's electricity installed capacity is hydropower), and the transport sector (30 per cent of the energy used in the transport sector in Brazil is derived from biofuels) (Swedish Agency for Growth Policy Analysis 2013). This must be studied in comparison to the condition the rest of the world fares with respect to the use of renewable energy. According to data collected and published in 2012, the above achievement of Brazil must be tallied in terms of the rest of the developed economies using only about 13 percent of renewable resources to harness energy within its all over energy mix, while the numbers are worse when it comes to the developing countries (Sperling 2012). The developing countries on the other hand use only 6 percent of renewables in their overall energy mix (Sperling 2012). Coming back to Brazil, it must be noted, however, that considering the above standard that the country has built for itself vis a vis the consumption renewables, at the same time, the reliance of the country on fossil fuels over the years have also increased when compared to international level. This is what heavily contributes to the anomaly that the chapter talks of in the beginning. Further, uncertainties cropping from the problems in building storage capacities of hydropower plants, discovery of new offshore oil resources in the country, the use of a big part of the Petrobras' profit to keep the domestic oil price low, has also contributed to projection in the demand for oil in coming years for the country (Swedish Agency For Growth Policy Analysis 2013).

This study will take a robust comparison between the energy consumption patterns of Brazil in comparison with India in the chapters to come. In this chapter, there will be an attempt to understand the energy mix of Brazil and decipher the energy poverty situation of the country. The impetus would be to discern, if the performance of the energy sector of Brazil has contributed to the energy security of the consumers of the country, keeping in mind the territory and subsequent topography of the country, at the household levels. The question that needs to be addressed while assessing energy poverty in any

country, is to recognise energy access of the citizens, not only at the level of physical access to energy but also the factor of affordability of energy alongside the assurance of having an uninterrupted supply of energy services at all hours of the day. This chapter would be a step to understand the same in terms of Brazil's internal energy demands and how the country has addressed the issue in the long term.

The Major Fuel Players at the Brazilian Energy Sector

Hydropower - Hydropower is considered to be the most accessible form of energy among the renewable sources of energy. This accessibility arises from some basic positives that hydropower attempts to contribute to electricity generation. Firstly, needless saying, hydropower is derived from water, which is considered to be a clean form of fuel. There is no need to be reliant on any other form of fossil fuel to start the production of hydropower, largely viewing it. Similarly, there is no generation of any form of energy waste, like nuclear power plants, for example, while producing power. There is thus no chance of associated waste management scenario (Sperling 2012). However, even while the production of electricity through hydropower process is denoted to be absolutely green when the theoretical considerations are kept aside, the process has several pitfalls as well. One of the major fallout of establishing hydropower installations is the large-scale displacement of population from the area where the hydropower project is proposed. This is one of the main reason why several hydropower projects have come to be criticised, especially in a heavily or densely populated developing region of the world. This is particular to both India and Brazil which are heavily populated and territorially big. To make the installation of a hydropower project in these countries, the government will invariably have to consider the dislocation of indigenous population. On the other hand, even while it might seem that there is basically the use of naturally occurring energy source that a hydropower plant feeds off, that is water, it must be kept in mind, that the process heavily contributes to the alteration of the constituency of the water in question, contributing subsequently to the quality of water as well as the aquatic ecology

involved with increase in eutrophication. Also, a hydropower plant contributes to the ecology of the region that it is proposed to build in, furnishing climate change, contributing to changing the course of rivers- sometimes permanent destabilisation of slopes, induce seismicity and ad to greenhouse gases- even while it is not of a huge volume (Sperling 2012). This condition has come to be researched in recent times heavily considering the fact that hydropower production has been largely disassociated with CO2 emission. Since the conditions giving rise to these kinds of emission are more complicated, both in occurrence and observance, there has been a call to study these situations intently (Sperling 2012). However, for the production of hydropower, a country does not have look beyond its own capacity. That is, drawing from the above point, there is absolutely no need for a country to borrow or import any sort of fuel from other countries. In comparison, for example, when a country decided to produce nuclear energy, which contributes to 11 per cent of the electricity produced in the world (World Nuclear Association 2018 http://www.world-nuclear.org/information-library/current-and-future-generation/nuclear-power-in-the-world-today.aspx), there is the need for the country in question to have access to uranium as a raw material In case the country does not have access to the same, then the country will be compelled to import the material from uranium-rich countries and enter into diplomatic and trade relations with the latter to achieve its goal. Similarly, for the production of solar power, a country shall need to have access to silica, which if not available domestically, one has to look abroad and embark in a complicated process of diplomacy and trading keeping in tandem with the present international political scenario. Hydropower on the other hand thus relies on the domestic source of energy, namely access to prevalently upper riparian rivers in the country in question. Thirdly, and most importantly while determining the affordability of the resource, theoretically the process of power generation through the said source is essentially a natural process making it affordable at least in the long run, cancelling the charges of establishing the hydropower generation installation. In the hindsight, hydropower also has some very interesting by-products like irrigation, and

flood control that additionally contributes to the economy of the country in question (the United States' Office of Energy Efficiency and Renewable Energy no date).

Since Brazil had embarked on the building of dams in its major rivers, there has been large-scale resistance by civilians affected by the displacement due to the installations as well as the affecting environmental altercations in the country. The Dam–Affected Peoples Movement (MAB) in Brazil is the largest of such groups which have built a social movement bringing to the forefront the problems that large-scale hydropower plants have contributed to the ecology of the country. The movement has also gone on to show that the problems of such large-scale installations have not been limited to environmental impacts but also gone on to show how corruption has been fanned in the wake of compensation to be given to the people who have been displaced by such installations. The beginning of the movement is marked in the 1970s during the construction of the Itaipu dam, alleging that the number of people to be compensated against the displacement caused by the construction had been made to be far less than it actually was the case (International rivers 2008 https://www.internationalrivers.org/campaigns/brazilian-dams). This movement was built in the backdrop of the military dictatorship in Brazil (1964- 1985), where the political will, the social realities and the civil liberties of the people of Brazil were set aside by the state (MAB 2011). From the Itaipu river basin and dam construction onwards, the fight by the movement was gradually expanded over the years to other river basins as well, when the government decided to expand its national hydropower project, like- the Tucuruí, Sobradinho, Itaparica, Itá and the Machadinho with the facilitation of smaller and local organisations of resistance (MAB 2011). In many instances, these organisations have also been able to champion some compensation through a collective struggle with the moto of securing 'earth for earth' ideals which underlines the belief that compensation of the displacement and expulsion of people from their indigenous positions in a piece of land of a

country for the installation of the hydropower project entitles the population to compensation worthy of the permanence. It is not only a slice of money that the people wanted but a system of rehabilitation that needs to be provided to them equivalent to the loss of habitat, livelihood and environment that they have experienced in the wake of the dam construction, but also a life post rehabilitation that matches the quality of life that they had before the same (Avancados 2007). Another factor suggests that there is very little scope of the people who are actually affected by hydropower projects to participate in the decision making of the entire process since they are primarily displaced from their habitat and the relationship with them essentially becomes confrontational in the process by non- identification of the interest of the primary subjects of the project (Avancados 2007). One of the main arguments propagated by the movement resonates with the basic question of the debate that the research chooses to address. The fact that natural resources, albeit in the form of land and in this case, water, must be viewed as public property. The idea of energy justice as well as the ideals of the eradication of energy poverty, in the long run, bears fruit only when natural resources are seen as public goods, and not as resources that can easily be privatized as competitive commodities. Only when such resources are viewed in terms of being public goods can one justify the argument or making energy extracted from the same access to the people. When it is seen as a private good, it automatically becomes not compelling to the private owner of the same to make it accessible to anyone else. It will be then made accessible only where the profit of selling the energy lies. The presence of MAB in as many as 16 states of Brazil, kind of reasserts this question that the research seeks to ask as well.

Brazil is one of the leading countries in the production of hydropower in the world. According to the World Energy Council, Brazil ranks only second, behind China, in the production of hydropower in the world. That also places Brazil before any other country in hydropower production in the Latin American region, even while Latin America holds the fifth position at the regional share of production of hydropower and third in the hydropower

production capacity at the world level (World Energy Resources 2016). This is a considerable feat by a developing country that must be analysed in detail for the benefit of this research. This must be understood in terms of hydropower being the leading source of renewable energy in the world. About 70 per cent of electricity produced from the renewable sources, across the world comes to be harnessed from hydropower generating 16.4 per cent of the world's electricity (World Energy Resources 2016). Similarly, in the same token, as per the data collected in 2016, hydropower makes for 16.3 per cent of the total production of energy in the world, compared to the other renewables making around 5.7 per cent of the share of the total energy production in the world (IEA 2016). In case of Brazil, there are around 176 large and 402 small hydroelectric power plants, with the Amazon basin serving as one of the main areas where all the major dams have been constructed (Sperling 2012). Around 20 per cent of its electricity demand is met from the Itaipu Dam, which is built on the Itaipu river and contributes to electricity generation for Paraguay as well, which shares the river with Brazil and contributes to 80 per cent of its energy consumption (Sperling 2012). Since Argentina lies in the downstream area of the river, it also participated in the planning of the construction of the dam and in agreements around the establishment of the dam. Similarly, the Tucurui dam is the largest electricity producing dam in Brazil.

On the other hand, the electricity sector of Brazil has been affected severely by consecutive droughts that the country has been experiencing over the years. Even while Brazil has achieved exceptional accomplishment in its hydropower generation capacity building, yearly droughts have majorly contributed to the non-access of electricity to the citizens of the country, especially considering that hydropower occupies almost three-quarters of the electricity produced and distributed in the country (International Hydropower Association 2018).

Hydropower is majorly owned by public industries in Brazil (International Hydropower Association 2018). The capacity of the country to produce hydroelectricity is about 260 gigawatts (Sperling 2012). Scholars like

Pierre-Olivier Pineau, Lucile Tranchecoste and Yenny Vega-Cárdenas have suggested a mechanism of introduction of royalties as ways to bring in customisation in the production and distribution of power generated, in order again to make hydropower more popular means to achieve sustainable energy for developing countries of the world, explicitly over the establishing subsidy system for the consumers for the same (Pineau et al 2017). They suggest that while this mechanism is in place with the exploitation and management of other energy resources like oil, gas and coal, similar has not been established in many developing economies, yet. This study, right at the outset, clearly charts out the necessity by the responsible government to create tax structures towards the producer of hydropower (in most cases when they are private entities), in order to discourage them from overusing the water used that naturally leads to the degradation in its quality contributing to water pollution. These taxes, as they suggest, must also be used effectively to ensure access of compensation to the communities that might have been displaced for the construction of the project. This reading however criticises and discourages the use of mechanisms like the establishment of subsidy regime in the form of price relaxation to the consumers as a mechanism through which effective compensation can be garnered for hydropower generation by the producing company (Rothman 2000, Pineau et al 2017). There are several ways to inculcate a system of establishing the tax rate depending on experiences of several countries that have relied on these. While some countries have applied taxation contingent to the size of the dams that have been built, or the amount of water that is used to generate power (tying value to water as a resource), sometimes depending on the seasonality of the availability of water, and scarcity in the availability of suitable site for building a viable dam for the production of power, while some other have depended on the amount of electricity produced by the dam, while another set of countries have relied on the revenue generated from the electricity produced by that particular dam (Pineau et al 2017).

Keeping the above in mind, one must note that Brazil has relied upon the last mechanism to impose a tax on hydropower producers in the country, that is dependent on the revenue generated from the power consumed by the dams (Pineau et al 2017). It has been observed that an approximation of 15 percent of available freshwater in the world can be found in Brazil (Almeida and Pinto Junior 2000, Pineau et al 2017). These water resources are jointly managed by the states of Brazil as well as the federal government, even while the

Wind power: the wind power technology in Brazil is also something that is gaining considerable ground in the country. Especially in the Northeastern part of the country, which features a massive coastline, the popularity of generating power from wind energy has gained acclaim, including the government's intention in contributing to considerable research and development. As per recent reports, the present installed wind capacity of Brazil is 11,670 MWs, making it the country with ninth-largest wind capacity drawing from 466 installed wind farms (Leahy 2017). However, the main problem with continued reliance on wind energy is the absence of indigenous technology to harness wind power. The recognition that Brazil might have a huge capacity in recent times to harness wind energy for the production of electricity, which might, on the other hand, help the country resolve its continuing problem of heavy reliance on hydropower plants and then delegated reliance on the thermal power production, becomes significant, keeping in mind the current global discussion around environmental concerns. The country still has to rely on the technology of foreign developed country to do the same. Currently, 11 gigawatts of turbines are operational in the coasts of Brazil (Dezem 2018). Even while there is the capacity of the country to generate a steady supply of electricity in future it has not yet become operational, even while ANEEL has definitely shown its interest with 77 approval for wind farms in the country (Filgueiras & Silva 2004).

Bioenergy: ethanol, biodiesel and sugarcane bagasse- incentives and subsidies for the use of bioenergy. Majorly for the purpose of transportation and agriculture. Not so much in the electricity sector. ~The National Alcohol Fuel

Program (ProÁlcool) and the encouragement to use biodiesel by the National Biodiesel Production and Use Program (PNPB). What needs to be observed in this context is the lethargy to invest by the government in the research and development required to come up with newer technologies to incorporate bioenergy at a greater level at the transport sector (Swedish Agency For Growth Policy Analysis 2013).

LPG- the use of gas a measure to counter situations of power loss in times when hydropower fails due to shortfall of rains, have increased over the years in Brazil (Swedish Agency For Growth Policy Analysis 2013).

Oil- Brazil is aiming to become one of the largest producers of oil by 2021 (Swedish Agency For Growth Policy Analysis 2013). Scholars are of the opinion that the demand for oil (Petroleum to be precise) and fossil fuels is to increase in the years to come for a booming economy like that of Brazil's, which, considering the tremendous benchmark the country has already achieved through the massive use of clean sources of energy like hydropower, is quite worrying. It would thus be important to look into the reasons the country is projecting a growth in the demand for non-clean fossil fuels in the years to come and ascertain whether the same would endanger energy access and affordability of the Brazilian population. How are the prices of oil kept artificially low?

Fossil fuels are cheap, while renewable energy, because they are comparatively new in terms of being a technology, especially in a country which has a developing economy, with a large portion of its population living in poverty, becomes expensive. On the other hand, the use of fossil fuels, even while being cheap, contributes to atmospheric carbon, in turn, being responsible for the adverse effect on the environment. Thus, the use of fossil fuel has been considered to be adverse to the ethos of sustainability, in turn contributing to the energy poverty of a country and negatively affecting the capabilities of its citizens. Thus, while fossil fuels make energy affordable and more accessible to the consumers, long-term use of the same makes the

consumers incapable of having a dignified quality of life, to energy poverty. In case of Brazil, Petrobras, the state-owned national oil company uses various mechanisms of price control coupled with subsidies, keeping the price low, to make the use of oil more lucrative to the consumers (Swedish Agency For Growth Policy Analysis 2013).

There was a major energy crisis in Brazil in 2001. It became imminent for the country to look into the possibilities of energy security in case their reliance on hydroelectricity comes in question, given the country is almost entirely dependent on hydroelectricity, which can be affected due to climatic concerns like droughts (Gomes 2017). The main reason why the hydroelectric power plants fail in the times of natural calamities, like shortfall in rain, is because the government has a policy in Brazil to feed the existing power plants from rivers, instead of building reservoirs for storage of water for non-rainy situations (Gomes 2017). In 2001, the crisis of electricity developing from drought almost debilitated the Brazilian economy, on the other hand propelling Brazil's import of LNG, to serve as an alternative to heavy dependence on hydropower.

This research focuses on Brazil's deal in the power sector. The above was an attempt to give a more comprehensive understanding of the entirety of the country's energy sector. It must be noted that the idea of energy poverty in a country cannot be ascertained completely with respect to only a particular section of the energy sector. It is not a concept that can be understood in watertight compartments. A comprehensive study of the entire energy sector is imperative in ascertaining the level of energy poverty in the country. However, for the sake of the simplicity of this time-bound research, it was imperative that only a section of the energy sector is taken into concern. The electricity sector was chosen with the understanding that in modern times, it is the access to electricity that is something that is viewed to go hand in hand with the development of a country, fundamental to the growth of a nation. Access to electricity is also viewed to be synonymous with the accentuation of capabilities of individuals in a society. Thus, the moot point of choosing the

study of the power sector in Brazil lies with the presumption that the sector has a profound impact on the well-being in the lives of people, enhancing their rights, dignity and human security.

The Liberalisation of the Electricity Sector of Brazil

The Brazilian economy had decided to embark on import substitution during the 1970s, via the National Privatization Plan (PND), to reduce its dependence on foreign capital and trade, and continued it with decades of domestic industrialisation through domestic market protection, following it with moderate trade liberalisation in the early half of the 1990s (Veiga 2017). The involvement of the state with the production of electricity came to be associated with the urge of the country to fuel its economic growth (Rufin et al 2003). The economic tradition of Brazil has thus been to play around moderate international investment in order to protect the domestic producers. Throughout the following decades, scholars have pointed towards the policies of the Brazilian government favorable to the domestic producers with protectionist trade policies with higher tariff rates for foreign producers till more recently in 2010 as well (Veiga 2017). In the case of the power sector as well, the country has dealt with semi privatization at the domestic level as well. The process of liberalisation of the power sector of Brazil began in 1995 with the selling of the ESCELSA (Espírito Santo Centrais Elétricas S/A) (Batista 1998). With the progression of time, during the Lula administration in 2003 opened the power sector partially to the private sector. There have been sections that are controlled by the government, while another that encourages the involvement of the free market. In the first trade market, the government plays a regulatory role in being the mediator between the generators and distributors, in the process regulating and overseeing prices. In the second trade market, the generators and distributors interact with each other under the auspices of the free market (Colnago et al 2012).

The possibility that this project seems to explore is the question of whether power generation through big hydropower projects, of which Brazil has come

to pride itself with, can be made more just, environmentally accepted and sustainable in the process. This way, constructive inputs can be made towards the elimination of energy poverty in the long run. The process of including the affected parties, for example, in the decision-making process is undeniably long. However, with the involvement of political and social will to address the issue, effective changes can be made. The first way in which hydropower plant system of production of energy can be invigorated is through a check in the construction of new power plants and 'repotentialisation' of existing plants and hydropower installations (Avancados 2007). This can be achieved by making sure that existing power plants work and perform to the best of their capacity. In the same token, options of building small hydropower projects, which are more remote in location but is contributive to power generation and supply to a small community, as opposed to building massive installations and plants and then trying to connect remote communities and areas to the grid that the plant contributes to.

The Consumption Pattern of Energy in Households in Brazil

The Brazilian Statistical Institute states that the rate of electrification of households in the country, currently, is 99.7 per cent, even while there are approximately 234000 households in the country that do not have access to electricity (IBGE 2015, Gucciardi Garcez 2017).

There has been a rise in social groups that advocate energy access in the country in a more transparent manner. Energy for Life ((Energia para a Vida) and the Movement of Peoples Affected by Dams (Movimento dos Atingidos por Barragens) are two such groups whose agenda need to be studied to understand the loopholes in Brazil's energy policy and subsequent energy security scenario. The former group came to be established in the year 2013 with the following theme of agenda of 'Energy: for what? For whom? How?' (Energia para a Vida no date) propelled by the perception of energy as a necessary right, the management of which, including the legal framework that guides and governs the energy sector, need to be in a transparent manner

involving the citizens of the country. The institution advocates candid sharing of information between the government that administers the energy sector and the citizens who consume energy through dialogues with the community and act as a liaison between technological research regarding energy and social movements for alternative sustainable energy. The main function of Movimento dos Atingidos por Barragens, on the other hand is to focus on the displacement of the population for the establishment of large-scale dam projects. It must be kept in mind that the energy sector in Brazil came to be centralised by the administration under the dictatorial regime of president Getúlio Vargas in the 1930s. The programme of nationalisation of industrialisation, which included the setting up of the most large-scale dam projects of Brazil, was continued by the Kubitschek administration, which was democratically elected, and continued through the military rule from the 1960s to 1984 (Gucciardi Garcez 2017). It must thus be highlighted that the environmental fallouts of these projects never came to be discussed and deliberated upon during the establishment regimes. Since most of these were military rules, it is a given that these energy projects, like any other industrialization projects undertaken by autocratic rule, are not exactly populist in character, with transparency. One of the main similarity between the two institutions is to ensure access to energy by the citizens of the country while keeping in mind the possibilities of delegation and decentralisation as well as reducing the social repercussions of energy projects at the local level. The concept of diversification of production and distribution of energy to the local sector came to be associated with the Luz Para Todos campaign, that gained its impetus essentially from the necessity to avoid or reduce the infrastructural cost of the production and distribution of energy. Also, several social movements, as already mentioned above, were tacitly responsible for advocating for an increase in transparency in energy production and distribution in Brazil, considering the social factor of the problem (Gucciardi Garcez 2017).

Distributed Electricity Generation (DG) is a mechanism that has been established by the Brazilian government to facilitate the delegation of electricity generation to local communities. It is permitted to be functional in residential complexes, This majorly deals with electricity generation at the local level depending on solar photovoltaics. This system functions through the dual mechanism of Net Metering and Feed-in-Tariffs. Through the Net Metering programme, when the DG produces excess power, it is flown to the power grid. On the other hand, while the DG does not produce power, the excess power once flown to the power grid is transferred back to the consumer. In case the consumer does not use some amount of electricity, then credits are transferred to the consumer. In the Feed-in-Tariff system, on the other hand, involves the distribution of incentives to the consumer in other manners. The DG system is also exempted from state taxation (Gucciardi Garcez 2017). The same study claims however that the Direct Electricity Generation has not been successful in providing electricity to the consumers at lower costs. On the other hand, it still is not completely capable of providing incentives for power production at the local levels to the interested producers (Gucciardi Garcez 2017). These are factors that would be dealt with, in details, in chapter 4, overseeing the institutional mechanisms involved in eradicating energy poverty in Brazil, for better clarity.

Electricity Price and Affordability

Brazil is a country that has effectively demonstrated a model when it comes to displaying mechanisms through which a developing country with a large territory and varied geographical regions might be connected to an almost integrated power system. A huge chunk of the population of the country today is connected to the power system. However, this system itself forms the bedrock of the question as to is extending electricity to every household and making it available to every individual in the country can be adequately demonstrated to be the end of energy poverty? It must be noted that despite being a country where the access to energy is all pervasive, whereby almost each of the 99 per cent of the population of the country have access to

electricity, the cost of this electricity is massive in a country like Brazil, even while compared to several developed countries like Japan and the United States. 3.4 per cent of household expenditure in Brazil is spent on energy as taken in 2011 (Winkler et al 2011). This excessive cost of electricity is such despite the country having one of the cheapest costs of production of electricity in the world (Farah 2013 https://thebrazilbusiness.com/article/electricity-prices-in-brazil). In this section, the major gaps in the electricity system of Brazil will be determined that is contributive towards the lack of affordability of the consumers of power in the country.

Overarchingly the factors that determine the pricing or the final tariff of power depends on certain determinable factors in the energy sector. At the very beginning, it is the supply and demand factor that foundationally determines the tariff of power. What percentage of the power demanded by the consumers of a country can be met by energy produced within the domestic limits of the country determines, or should determine, in a complex web of negotiation the tariff of power supplied to the consumers. In the same token, superficially determining, the price of energy rises and falls keeping in line with the demand for power. Following from the above, the tariff is also determined by the energy storage capacity of the country in question, which affects the difference between the demand for energy and the supply of the same in the sector. Forecast price is something that guides the tariff system of any electricity sector of a country, determined by the intricate conference of the forecast of demand for electricity. It depends on weather forecasts depending on the regions of a country. Essentially also, the price of energy depends on the cost of transportation of the same from the region of production to the region of consumption. In the case of electricity, transportation cost is determined by the status of the electricity grid and the network of gas pipelines and the electrical transmission capacity of the country. This, in turn, is also determined by the territorial terrain of various regions in the country, and what are the projected weather conditions of the same. How geographical

terrain effects the access of consumers to power will, however, be elaborately discussed in the next section of the chapter. Further, import factors of the energy also determine the pricing. In some cases, energy, while transported from one region of the country, becomes more expensive compared to energy imported from neighbouring countries to congruent regions of the country. Lastly, a composition of government regulations and government energy policy can also serve as major drives of power tariffs. Government policies, in most cases, are expected to serve as cushion towards energy access and affordability of the consumers, that keep the latter protected from erratic, sometimes incongruent and paradoxical tenor of the global energy market. In the same line, the government policy towards sustainability, with respect to changing the energy mix of a country, changing the foundational component of the also have contributive character towards the energy tariff.

While discussing the electricity tariff regime in Brazil, it is incumbent that a study of the system is done. Brazil is touted to be a country that has the highest electricity prices in the world. Given the all-pervasive nature of the rate of electricity to households in the country, it is a surprising factor that must be studied in detail. This would unfold an area of the energy poverty debate that is seldom discussed. This is especially given the fact that the country has one of the largest and efficient hydropower plants in the world, that serve as a point of comparison for many other countries looking to achieve the same feat and replicate similar levels of installed development. To the contrary to the above, the cost of Brazil's electricity tariff is more expensive than many developed countries of the world like Japan, Netherlands and the United States, despite having a lower cost of electricity production as of 2013 (Farah 2013). It must be interesting to study the reason that has given rise to such a dilemma. It was found that before the consumption of electricity. For the beginning, it might be helpful to look at the average cost of electricity that households have had to pay throughout the timeline of the study. On the other hand, lower electrification rates might contribute to the average energy consumed by a household, as in the case of developing

countries like India or Nigeria. However, since electrification rates of households in Brazil have been quite high and steady, the same standard cannot be applied to the country. On the other hand, under the auspices of the ANEEL, the power system runs in a regulated environment, whereby there is price cap for the distributors which it has to adhere to, putting an upper cap to the amount of money that can be charged for electricity to the consumers. However, despite the prevalence of hydropower in the electricity system, the security of the supply of energy becomes seasonal and there is a heavier charge that the consumer has to pay for the dry seasons (Lino et al 2011). Thus, the main aim of the regulator is to ensure the supply security of energy to households, which lays bare the main criticism to the ultra reliance on the hydropower system for electricity generation in the country. It must be also mentioned here that the hydropower projects that are running in Brazil are majorly running lower than their installed capacity. There is the system of having contracts for the supply of electricity between the consumer and the distributor. In the same token, there is the necessity for power to be consumed to be traced back to which hydropower plant that power comes from. In other words, there should be a power plant physically present to be able to ensure that the contracted amount of electricity is provided to the consumers at the time of consumption. Tariff is determined on the basis of the cost of production and distribution of power, in terms of, fixed costs and non-manageable fluid costs. While ANEEL controls the fixed costs at the beginning of every renewal of the contract withe consumer, the non-manageable costs are applied to the tariff as and how they appear (Lino et al 2011). Since the 1980s the electricity consumers of Brazil have had to pay 12 per cent more than that they have to pay for electricity in the wet months (Lino et al 2011).

The main challenge in this system is the fact that there is a great deal of uncertainty involved in the prediction of damnd from the consumers that is to come by the distributors. As per the guidelines of the ANEEL, the distributors only have 3 per cent wiggle room when it comes to the gap between forecast

in demand and the actual demand electricity. This leads to a large chance of energy insecurity in the part of the consumers, for whom, there might be a challenge to access energy at affordable costs, especially in the dry seasons of March to August (Lino et al 2011). This might also lead the consumer to buy energy from the short term markets at an exorbitant charge that creates, in turn, energy poverty. In the dry seasons, when there is considerably less rain in Brazil, the power system which withdraws heavily from the hydropower system reliant on the river systems, the consumers find it very difficult to have access to energy. In those times, they have to rely on the supply of electricity from the thermal power plants that are inefficient and are expensive to even begin with because of extra taxes that thermal power production has been levied with (Laveiri 2015).

For low-income families, the Brazilian government has devised a plan to provide discounts through the prime electricity utility company of the company, like the Eletrobras (Eletrobras no date). When a family consumes less than and up to 30 kWh in a month, a discount of 65 per cent is given to the household. Moving on, when a family consumes beyond 30 kWh to 100 kWh in a month, in terms of power, it is liable for a 40 per cent discount to its monthly bill. Consumption of power between 220 kWh and 100 kWh is given a discount of 10 per cent, while consumption beyond 220 kWh doesn't receive any discount at all (Eletrobras no date). This system has a regressive discount model, whereby, the higher the power consumption of the family, the lower the rate of discount mated out to it. This gives a clear understanding of a limitation that the government has put with respect to the amount of power a household is expected to spend in a month, beyond which, no amount of tariff remission would be entertained. This is a way to encourage sustainable consumption of energy by the consumers. It must be noted that this discount structure along with the system of establishing smart grids by the ANEEL puts the onus of energy consumption and sustainable use of energy on the consumers. The idea is to make sure that there is no wastage of energy on the part of consumers which can be analysed as a way to define energy poverty,

arising from the lack of energy, as a consequence of wastage of energy, as something that arises only when the consumers are not responsible enough in spending the energy that is provided to them in the way that they are supposed to. It is given in such kind of perspective that energy poverty essentially arises from the wastage of energy by the consumers, which is a pretty limited view of energy poverty. While the wastage of energy is a real issue that must be dealt with sincerely, the problem of energy poverty is a complicated issue that arises from the access point of power. While the idea is not so much on the wastage of energy, but it must be also kept in mind that the consumer household must have enough energy to sustain itself, to begin with. Enough energy is tied directly on the other hand to the capabilities of a household. The energy policy, extending to the energy tariff policy of the country must ensure that the tariff regime and the discount models do not isolate the consumer from realising the potential of the consumer and the household be it either for consumption capacity or for production capacity. What then is the amount of energy that can be seen to be enough for a household to realise its capability again, is a complicated scenario to deal with. However, while tariff rates might vary from one region to another, size of a household remain varied based on the number of its members, the average income of the household, the number of individuals in the household who earn, energy poverty ideals hold it to be the responsibility of the government to make the starting point of energy based capabilities to be equal for all kinds of families. Regressive discounts in the tariff rates of households, in so many ways, destroy this perspective in creating the political as well as the social will to generate progress in a household keeping up with the capabilities it might generate.

Also, these discounts are given to families with low income and those who have some forms of vulnerabilities, like ones with elderly people in the household, or person with disabilities, people who are Beneficiaries of Continued Social Assistance (BPC), whose income is below or just about the minimum wage determined by the government. This understanding also, in a way, shows how the families that are vulnerable in a society are also expected

to not only spend less in power but also consume less power than average. This expectation definitely does not fit in with ways to eradicate energy poverty. The system of energy justice essentially tries to explain that the capabilities of an individual and collectively a household is compromised when there is less energy in the system for them to consume. On the other hand, the impetus should be to make sure that the starting point of every household with respect to power consumption is in tandem with the capabilities of the household so that every household has the same starting point while realising those capabilities. To limit the consumption of a household, which is vulnerable in many ways, goes exactly opposite to this idea as well as intention. The United States Energy Information Administration states that the even in the state of the country where electricity consumption is the lowest, that is Hawaii, 6074 kWh of energy is consumed annually by a household (EIA 2018). Rounding it off, on an average thus, a household there consumes 506 kWh of power every month. Given that the USA is a country which is viewed to be one of the most developed in the world, expecting 220 kWh of energy in a month is way below the mark of expectation for any household. This, given that today there is the presence of advanced electrical appliances that make the life of a household easier, enhancing its capabilities, expecting a household to make do with such radical limits to consumption is equivalent to not letting it explore its capabilities to its full capacity. Thus, even while what might be the sufficient average energy to be consumed by a household is subjective to several factors, and probably can be correctly assumed by household based energy audits, the presupposition that when a household is economically or socially vulnerable, it will consume considerably lower energy than other average households is a wrong conclusion to derive.

Other than the standard price system in Brazil the price of electricity, as mentioned already, rises abruptly during the dry seasons. Not only that, during bouts of dry years, the consumers have to face a tremendous rise in the price of power. This has happened several times in the country due to consecutive

droughts. Consecutive droughts in Brazil from 1997 to 2006 has led to the establishment of several new water management policies. They are- the National Water Initiative (2004), the Water Efficieny Labelling and Standards Act (2005), the Water Act and the Amendment Act (2007, 2008), etc (Junior et al 2016). However, these water management rules have not given rise to responsible use of water in Brazil. The constitution, mechanism and function of the system are dependent on the political will of the Federation at large and does not take adequate consideration of either the environment or the interest and demand of power consumers as well (Junior et al 2016). Since the last four years 2014 to 2018, there have been consecutive rises in electricity tariff rates due to drought, and the heavy reliance on electricity production on hydropower plants and stop-gap reliance on unsustainable environmentally non-conducive thermal power plants, which are expensive.

The subsidy system in the electricity sector in Brazil- The tariff rates in a country of power is also dependent on the system of subsidies to consumers depending on their affordability in accessing electricity. It has been found that Brazil, for that matter, is a country that has a very robust system of subsidies that are given to the consumers, in order to contribute towards making an effort by the country to encourage the choice of the consumers towards selecting a certain kind of sustaining source of energy over other non-sustainable options. One major criticism of the subsidy regime has been towards the idea that when the government provides a subsidy for the consumption of energy, it leads to overuse and subsequent wastage of energy (Climate Policy Initiative 2017).

Brazil's government, since 2015 has developed a colour coded (green, yellow and red) tariff 'flagging' system. This has been introduced by the National Electric Energy Agency of the Brazilian government, through which the consumers are made aware of the cost of production of the power that they are using in their households as well as the status of the production of the power at a given time (Energia 2014). The main argument in bringing up this system is to make the consumers more mindful of the usage of the power and its value

in order to avoid any future wastage. The aim is to make the consumers aware of the cost of the energy that they are consuming at any given time and the variations that take place in the pricing of the same subject to any given factor in a more transparent manner. Thus, when the colour is green, it suggests that the cost of energy that is being consumed is low at that moment, or that particular day. Similarly yellow suggests that the cost has risen, with red implying that the cost of energy that is to be charged by the distributor that particular day is going to be on the highest end. It has been indicated by the government of Brazil, by the inclusion of this system, that this will make the consumer more careful of the energy that they use and budget spending energy based on the availability of resources on a given time, whereby the adjustment to tariff rates made at the end of a year of consumption of electricity, that has been garnered in lieu of extra cost beyond the established rate of distribution of energy, does not come as a surprise to the consumers (Energia 2014). While the system can be credited with the introduction of a procedure through which there is the inauguration some sort of transparency and clarity in the way that tariff rates are calculated and balance of the cost of production and distribution of power is added to the annual electricity bill of the consumer; the system does not still enumerate what can be a clarified mechanism to cut energy costs and make electricity more affordable to the consumers. The problem here lies with the understanding that whatever is available with respect to the production and distribution capacity of the country, must be accepted by the consumers at any cost available. If the cost of energy production and distribution is made out to be more than average rate, then it is up to the consumer to decide how to consume that energy, irrespective of the charge that they might have to pay for it. The bottom line of the critique to this system is with the fact that some basic amount of energy in the form of electricity, required by a household, does not change on a daily basis. To expect that the consumers will be more mindful of the amount of energy that they must spend, depending on the daily pricing of energy is a cost that does not protect them from the fluctuations of the energy market. The requirement, that is, there is the need for a cushion, that must be provided by the

government, in order to protect the consumers from the volatility of the energy market does not seem to be fulfilled by this system. The main question of how energy can be made accessible within an affordable range is not addressed.

Territory and Region as a Contributing Factor to Energy Poverty in Brazil

When renewable energy is taken seriously as the means to achieve access to sustainable energy, one very important factor that cannot be overlooked appears to be the terrain of the country in question. Brazil is a country tropical country that occupies 8,514,215 square kilometres of territory in South America. The magnitude of the territorial boundary of the country comes with the vastness of geographic features to be considered while looking to electrify the region. This is particular to every country of the world where the geography of the same plays a very important role in determining the scope of energy access in the various regions of the country.

Brazil divided into the following regions of the- North, Northeast, Center-West, South-east and South (Duran 2013); based on the contiguity of geography and economic and socio-political factors. The country is further divided into 26 states and federal districts. There are seven states listed in the North region, which is the largest in the country territorially, but with the second least population. Principally, this region comprises the Amazon rainforest, characterized by the typical equatorial climate of high rainfall and high temperature and economy contiguous with the geography of the region. Mining of iron and coal are the main economic activities of the region. The Northeast part of Brazil lies along the coasts of the country with the largest coastline in the country with a variety of weather and climatic conditions. Being situated on the coast, the region comprises of a mix of indigenous people and colonial Portuguese settlers. Drawing from the above, it would be found that this is the region that has experienced the first contact with the colonists, slave traders, being the hub of sugarcane farming and export. The Center- west part of Brazil, consisting of 4 states, has similarities to the North

with respect to being the second largest section of Brazil while being the least populated of the country. Brasilia, the federal capital of Brazil, which is the seat of political state of the country is located in the Center-west. This region has borders with all the other regions of the country, making it the centre of the seat of power and have been a station of the military in the past. The centre-west mainly include large farms and farming community with low population density in the villages alongside and commercial agriculture being predominant in the region in recent years. On the other hand, it is the hub of huge urban population density specialising in fertilizing industry. The Southeast consists of four states and districts of Brazil with the highest density in population, economic activities and infrastructural development concentrated in the region. It has the largest and most equipped ports of the country connected with the largest rail network of the country and the location of important states like São Paulo and Rio de Janeiro, making it the economic and financial hub of the country. What is of importance and notice to the intent of this chapter is the location of the largest hydropower plants of the country in this region with Minas Gerais being the state that is the source of some of the largest rivers of Brazil. The South, being the smallest region in Brazil consists of the largest population of the country.

The transmission of electricity is one major factor in determining electricity tariff rates and prices of power in the country. It is an invariable factor that also determines energy security in the country. The Amazonas, Amapá and Roraima are the regions of Brazil that are not connected to the central or national electricity grid of the country (Energia 2014). Even while a vast majority of the urban population have access to secure energy, except severe drought seasons, there are several communities living in indigenous conditions of the Amazon who do not have access to electricity. They derive their electricity from unsustainable sources of diesel generators, among others.

It has been stated already that the hydropower projects of Brazil contribute largely to the electricity production of the country. A study in 2007 by Estudos Avancados stated that at that time while the installed capacity of hydropower

in the country was around 74 megawatts, it was only around 28 per cent of the projected capacity in the field, the latter being around 260 megawatts (Avancados 2007). This speaks a lot about not only the energy capacity of the country but also alludes to the attitude that is essentially competitive in nature, claims the study as well. As it has already been discussed, and the study also displays, the projected capacity of hydropower is appropriated by the private players to project as a possibility to the government to exploit the resources, irrespective of environmental concerns (given Brazil is home to the Amazon rainforests) and due attention towards the contingency of large-scale displacement of population (especially indigenous).

Conclusion- Access to Energy Contributing to the Capabilities of Consumers in Brazil

Merely considering the consumption of energy, or electricity for this matter is not enough in attaining a comprehensive understanding of energy poverty. Energy in a country, by even a household, is not necessarily used for consumption purposes, but also for productive capability (Coelho and Goldemberg 2013). A study if the system reveals some unique factors that contribute to energy poverty of energy consumers in the country. Firstly, the power system of the country is largely depended on the hydropower system. While it is a commendable feat that a large country, as big as Brazil has achieved a great feat by transforming a large part of its electricity generation on renewable source of economy, the dependence brings with it the seasonal character that is a standard problem with power generation from any source of renewable energy. That has been a consistent observation in Brazil, given the extended periods of drought the country has experienced, which has given rise to energy insecurity. Even while the country's hydropower system boasts of the storage capacity as well, it has not been able to solve the situation. This has given rise to electricity prices for the population in difficult times. Needless saying that the section of the population that does not have economic security, are the ones that face tremendous hardship during those months of the year. On the other hand, even while there have been efforts by the

government of Brazil to shift power generation to the thermal power plants, it cannot be seen as either a sustainable and environment-friendly source of energy or continuous in character. Again, even while the power generation system of Brazil has been largely regulated, the large-scale privatization of the system. Privatization in many ways than one seems to be the process through which the responsibility of bringing capital to the power system has been delegated to private entities. This in many ways is not a sustainable process. It has also been observed that the mechanism of regulation through price-capping on the distributors while coupled with involving private capital has stretched the expectation of the state in the sustainable distribution of energy to the consumers. Price capping causes the problem of restriction on the profit model of the corporates who are responsible for the distribution, while on the other hand making them speculate on the possible consumption pattern of the consumers without may be a proper analysis of the demands and requirement of the consumers. This also is a complicated process that creates confusion, as well as during the time of energy crisis in the country, which is often every year, especially in the dry seasons, the consumers are forced to acquire energy from sometimes other and unreliable sources. Also, the systems of metering, discounts and flagging meters of the consumers are ways in which the onus of energy poverty seem to have been put on the consumers and their consumption patterns, even while compared to developed economies, the household consumption of electricity in Brazil is far less. However, to the contrary, the electricity tariff that the consumers have to spend on an average is exorbitant, even while comparing with the least tariff margins of the developed countries. Thus, even while electricity has been reached to the vast majority of the population in Brazil, the country is not free from energy poverty. In fact, the source of energy poverty in case of Brazil arises from the point of lack of security of power from hydel projects in the dry season.

The study in this chapter thus concludes that there is considerable abruption in the realisation of the capabilities of a household in Brazil when it comes to energy poverty. It has been explained in detail that only making energy

accessible to the population is not enough to either secure energy, eradicate energy poverty in the process, or enhance the capabilities of a household. Human nature is such that they are able to acquire the basic minimum energy required to sustain in whatever ways possible. Even with respect to Brazil, it has been observed that there are areas that are not directly connected to the electricity grid, they are able to acquire energy from other albeit unclean sources. However, ensuring this access to energy does not, in anyway, explain the recession of energy poverty. It also does not make sure that the capabilities of the household are explored to the greatest margin because when fending for an unclean as well as more expensive source of energy, a household definitely makes the choice to achieve only that much of energy which ensures nothing but sustenance. There is no scope thus for production capability beyond barely meeting their consumption capability. Thus energy poverty remains in Brazil's power sector.

Chapter 4

Energy Policy and Institutional Mechanisms to Deal with Energy Poverty: Case of India and Brazil

Energy policy of a country is determined by the access of the country to energy. However, the most essential part of a country's energy policy is resolved through addressing issues related to the proper production and distribution of energy. The most basic and critical contributive of the energy policy of a country is thus substantially the energy legislation of the country. Energy legislations lay down parameters as well as perimeters of a country's energy policy as well as chart out procedeum to attain the targets hence schemed and drafted, enumerating the regulation of the plan. Energy legislations thus can be observed to be the starting point of a country's objective towards a comprehensive energy policy. On the other hand legislations act as formal, official benchmarks to attain the above objectives. Energy legislations of a country includes bills in the legislative bodies of these countries that would define the modalities of energy policy and energy security in extension of the country. In this chapter, the intent would be to perceive the legislative interventions of the developing countries of the world, especially through the prism of India and Brazil, so as to conclude towards the state's interposition while approaching energy poverty of these two countries of India and Brazil. The intention would be to conduct an interesting study of these legislations that administer the energy policy of these countries. It is imperative to note that energy policy is asserted through energy legislations of a country via bills, acts or drafts of the same effect in legislatures, any document that clarifies the state's position towards energy planning, production, distribution, transmission and its usage; as well as through the devices of taxation; accession to international energy treaties (international treaties that the subject countries are party to and how their domestic energy policies interact with the same); policies related to subsidies provided to

private entities (where case may be) as well as consumers (in order to choose from various sources of energy and popularise more sustainable form of energy consumption); various incentives to promote involvement of private capital in production and management of continual, viable and sustainable sections of the energy sector (if need be); and review the organisation and regulation of the public owned energy sector. This study would intend to make a comprehensive list of all such mechanisms undertaken by India and Brazil to get an extensive picture of the energy poverty situation of the countries.

In summation, energy policy of a country is essentially an aggregate of the establishment of relevant, vigorous and secure institutions of energy management in the country, that reflect the long term energy vision of the same. On the other hand, a robust energy policy involves the engagement of all stakeholders of energy security in a country. Non-engagement of the interest and participation of any one section of stakeholders might lead to the formulation of energy policy that is half baked and thus incomplete. Similarly, successful energy policy must involve necessary political leadership that is able to assimilate imperative political will and political consensus around the said policy. In the same token, it is essential that a vibrant energy policy is kept up to date with changing technology, climate markers in general, changing international environmental goals, as well as the aspirations of the citizens of a country, whereby their personal energy security is favourably transformed into human security.

Energy Poverty and Energy Policy: the Linkages

Needless to say that a country's energy policy has profound impact on the energy poverty situation of the country. In fact it would not be farfetched to observe that the relation of a country's energy policy with energy poverty is rather symbiotic in nature. While the energy poverty scenario of a country would act as a directive towards framing a more sustainable energy policy of a country, whereby the attempt of the government would be to manage the energy gap experienced by individuals and citizens of the country, the latter

would in turn act as a mechanism of prominence towards alleviating energy poverty with a more sustainable energy plan best suited for the country in question. It is thus only imperative, that to do justice to the title of the chapter an umbrella study is done to understand how energy poverty scenario in India and Brazil interact with the energy policy of the country. Rather, this chapter aims to follow if the existing energy policy of these two countries are in line with the practical situation they face in relation to their energy poverty.

Energy security and Energy Policy: The Linkages

Energy security thus of a country heavily draws from the domestic energy policy of a country. It has been discussed earlier how energy poverty of a country has tremendous bearing on the energy security of a country. The idea how energy poverty holds significance in understanding the energy security of a country would be discussed in greater detail in the 5th chapter of the thesis, for advanced clarity. However, the connection between the two concept is relevant in the perception as to how energy security is ensured by energy policy of a country. By logical layout, while energy poverty is seeked to be eradicated by a comprehensive energy policy of a country, energy security is attained to a great extent. Energy policy thus acts as a touchstone towards a discursive analysis of the energy poverty scenario of a country as well as means to attaining energy security in the process. Energy policy of country provides a study of the top down approach to energy security of a country. While the intent of the thesis is to derive a bottom up study of energy security, to understand energy poverty, a unidirectional approach, compartmentalised from its interactions with the state's approach to the concept shall not be enough. It has been explained before how energy poverty as a concept has been understood differently by oft diverging groups of scholars. To leave out state's intervention in determining the energy policy of a country would impair an all round study of the energy poverty situation of the country and obstruct obtaining a conclusive path to alleviate the same.

A Phase-wise Analysis of Energy Legislations in India: Energy legislations before Liberalisation

Electricity and all issues related to it has been placed by the Constitution of India in the concurrent list, to be dealt with both by the central as well as the state governments of the country, giving it a quasi federal structure (Niranjan 2004, Kaladharan 2017). The electricity sector of India came to be governed initially by the Indian Electricity Act of 1910, followed by the Electricity Supply Act of 1948. Vide the Electricity Act of 1948, the states of the country have been entrusted with the authority to ensure, in theory, manage and promote the electricity industry in order to achieve universal access of energy along with the central government of the country (in the form of electricity) to all. The State Electricity Boards (SEBs) via the Electricity Act of 1948, have been given full autonomy in the generation and distribution of electricity and the overall maintenance, planning and development of the power sector of the respective states alongside the Central Electricity Authority of India (CEA). The CEA was also responsible for power related legislations of the country alongside long term planning of development regarding the sector in general.

The regional level grid management came to be established alongside the establishment of five Regional Electricity Boards (REBs) in the 1960s to be general and 1964 to be particular in India, to stimulate the sharing of surplus power generated in one state with the other, in a particular region. The state governments financed the functioning of the SEBs through loans, whereby the latter controlled almost 70 percent of electricity generation in India. At the state level, the SEBs were in control of determining the tariff of power to the consumers. Before the liberalisation of the power sector was propelled in the 1991, it must be mentioned that the functioning of the SEBs had led to a 9.2 per cent growth of the power sector of India from 1948 onwards (Gupta 2012, World Bank 1991). However, the tradition of providing subsidized and often free of charge power to a comprehensive section of the population did lead the SEBs develop huge losses over the years since the independence of the country. More than the intent to provide energy to the poor population of the

masses (especially since those were the crucial and formative years for the country since independence), the loss of balance of payments in the power sector was incurred through mismanagement of the entire process. De-metering, for example led to absolute negligence in monitoring the energy consumption pattern of agricultural consumers, whereby, since electricity came to be supplied to a large section of agricultural consumers almost free of any charges, it was not considered important to measure the amount of energy actually consumed by agriculture, further leading to failure in understanding the exact amount of loss incurred by the SEBs in supplying electricity to the agricultural sector of the Indian economy (Gupta 2012). Further there were cumulative losses incurred from electricity thefts. When the long term plan of a state government is to provide electricity to the poor (here the farmers), there is the necessity to have unambiguous proposal as to how the government would choose to restore the resources of the SEBs once it is depleted. However, the lack of proper long term planning on the part of the state governments to do the same supplemented the loss of the SEBs. Proposals by the government to replenish the SEBs' funding via cross-subsidies were also a plan that came to be reviewed by scholars as self failing. Making corporations pay more for energy that they need for running their businesses, at the cost of providing subsidised electricity to the agricultural class, led them to build their own company specific oil exploration possibilities, but drilling oil themselves fulfilling their demands (Thakur et al 2005, Gupta 2012). A culmination of all these factors lead the government of India towards liberalisation of the electricity sector.

Liberalisation of the Electricity Sector (1991)

The power sector of the country came to be liberalised in 1991 with the possibility of involvement of private capital in the generation of power, besides beginning the planning for the establishment of a national grid for power sharing. This initiative of the Indian government at that time was in tandem with the overall drive of the state to liberalise the economy of the country. Through the Electricity Laws (Amendment) Act of 1991, power

generation plants was allowed to be established, operated and maintained by private bodies. The liberalization of the electricity sector at the level of electricity generation came to allow 100 percent foreign investment in the power sector without any export obligations. The Orissa Electricity Reform Act 1995, with assistance from the World Bank programme, initiated the process of privatization of the power sector both at the generation as well as at the distribution level, which led critics into believing that the concerns of the private entities in the process was only to remove subsidies to the consumers of all sorts and increase tariff rates of electricity (Gupta 2012). This has been a consistent problem of the power sector in India, especially with the involvement of private capital, in times when the economic development of the country has not been as high as it is today. However, it must be noted, that the transmission section of the power sector remained in the hands of the state in question. Thus while the generation companies could decide on what rates they would sell power to the transmission companies, the latter could not regulate the tariff rates at which to sell power to the distribution companies. This failed the purpose of developing the power sector in general of the India, considering the attempt should have been not to encourage private accumulation of power, but to increase availability of affordable power to the consumers of the country, most of whom were still below the poverty line. The resultant has been a substantial raise in tariff for the consumers, with no relative growth in the power sector as could have been expected, since the proceeds generated from the tariffs were not put into the power sector (Gupta 2012). Notwithstanding this, other state electricity regulatory bodies followed the same precedence. Later, in the year 1998, propelled by the problems faced by the growing privatisation of the energy sector, the Electricity Regulatory Commission Act 1998 established the Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions (SERC) whereby the tariff regulatory capacity of the CEA was relocated to the CERC. The power of the CERC came to be further enhanced by the Electricity Act of 2003.

It is the authority of the CERC that comes to govern the primary functioning of the power sector of India. First and foremostly, it controls the mechanism of price or tariff regulation to the consumers of the country. This price control came to be determining in all sections of the power sector, be it in electricity generation or distribution to the consumers. Thus, the CERC came to function as an umbrella organisation that determines the price rate of power, in a way acting as a shielding body cushioning the consumers from unforeseen tariff rise, culminating in easing of energy poverty in the long run. It not only determines tariff of power sharing between two states but also regulates interstate functioning of transmission of electricity, fixing trade margins wherever necessary. It also, to a large extent, regulates the tariff rates to be determined by privately owned power generation companies, at times bringing down the price rise considerably and making energy affordable..

The Energy Conservation Act of 2001 and its Implications on Energy Poverty

A major energy initiative by the government in the following years came to be the Energy Conservation Act 2001. The main feat of the Energy Conservation Act 2001 was to establish the Bureau of Energy Efficiency (which was set up in 2002), in capacity of being a statutory body constructed under section 3, sub-section (1), under the supervision of the Ministry of Power in India by merging the erstwhile Energy Management Center (Ministry of Power 2017). The purpose of the Bureau is to ensure energy efficiency in the energy sector of the country, through institutional framework of making certain appliances produced in the country get accredited ratings by the Bureau ensuring energy efficiency and reduce energy intensity in the country. The Act gives power to the Central government of India to authorise a certain standard of energy competence to prohibit the manufacture, distribution and import of appliances that do not conform to the standards established by the Bureau and established codes of energy conservation; and in some cases also the State governments to modify these codes based on regional specifications and conditions like the local climate (Kumar 2010). What is energy efficiency for a particular region,

might not be the same in another region of the country. Given the vast territory of India, it experiences different climate and environment standards. There are places and regions in the country which experience tropical climate, with generally hot and humid climate. There on the other hand are regions that experience cold temperatures. Energy needs of these two regions cannot be the same. Thus, state governments have the authority to tweak standards of energy conservation according to this Act. The establishment of the Bureau was done keeping in mind the sustainability factor of energy explorations and the growing concerns regarding environmental degradation with regards to energy consumption at the international level. This Act came into existence in the backdrop of growing international anxiety around environmental deterioration with worldwide growth in carbon emission. The increase in the emission of greenhouse having a tangible repercussion on the environment of a particular country as well as the world as a whole has been deemed to be an important issue whereby several attempts have been made at the international level to mitigate it. The Energy Conservation Act can be viewed in the same light. In summation, the Energy Conservation Act's main purpose has been to ensure that basic environmental concerns of the world are kept in mind during the production of energy appliances, and elementary environmental standards are maintained while doing the same. On the other hand, or rather, in the same token, it is also the responsibility of the Bureau, established by the said Act, to ensure that energy appliances, both those produced in the country as well as imported warrant a sustainable consumption of energy. In this light, the Act makes sure that energy appliances in the country do not accelerate energy depletion and encourage sustainable energy consumption pattern. Further, the sale of energy inefficient energy appliances are restricted in India vide this Act. This Act can be seen to be instrumental in bridging the gap between energy security and energy poverty. In modern times, with growing use of electricity in an average household in India, the use of various electricity appliances or appliances using any other forms of energy, has become a common phenomena. The use and propagation of use of energy appliances certified by the government of a country ensuring a model of sustainable use

of energy makes it more available to the citizens of the country. In the same light, conservation of energy, which is the ultimate purpose of the Act, will in the long run check price rise making energy affordable to the consumers. This way, energy is not only secured by the state but also the latter ensures a step towards tangible reduction in energy poverty of the masses. The main function of the Bureau is thus to establish leadership in the field of energy conservation and sustenance, through certification of efficiency as well as conducting regular audits to ensure this sustenance. Further, an important task of the Act, via the Bureau is to propagate information about energy conservation and encourage sound habits of energy consumption among consumers through the use of energy efficient appliances.

This act was thus the first and the primary legislation via which the Indian government chose to recognise the growing global concerns regarding progressive environmental degradation. Through this legislation, India chose to upgrade the modalities of how power must be distributed and consumed at individual levels in the country. One might wonder how the introduction of such regulations to establish standardisation of the consumption of electricity through upgradation of technology (read electrical equipment) might contribute to the alleviation of energy poverty at the individual level. It must be noted in that case that the unsustainable way that energy has been consumed through ages have been the main factor contributing to the rising amount of greenhouse gases in the environment. An unsustainable nature of energy consumption of unsustainable practice of energy consumption essentially contributes to energy security of people at the individual level. While, on the one hand it leads to wastage of energy, on the other hand, the cost of energy consumption also rises. While it is not always readily and tangibly available cost of consumption that is available to the consumers to judge and introspect, it is a cost that one must heavily pay over a period of time. This legislation was the first of its kind in India to recognise this take and act accordingly by focussing on the necessity to energy efficiency and how it impacts energy security of a country. On the flip side, it must be noted

that not all regulations and standards laid down by the legislation came to be binding on the consumers. Some of them were voluntary. One of the largest criticisms one can have of this legislation is of the idea that there is an option for consumers to choose between whether to abide by some of the regulations. Not compliance with regulations in the use of a certain type of electric appliance continues to be contributive to unsustainable energy use on the part of the consumers. It must also be noted that the implementation of such standardised electrical products only came about around 2006. Also, one must also note whether the imposition of these standardised regulations are contributive to the cost of that particular appliance. This is important to note in the context of the fact that one of the main reasons that Indian electricity consumers choose to stay away from voluntarily connecting to the electricity grid is due to its high tariff rates. An increase in the price of an electric appliance is something that definitely contributes to their personal energy choices, contributing to individual energy poverty. One of the major contributions of this Act was to create a pathway for India to establish a structure of efficient energy consumption. The motto of the Act was to act as a preamble to this path as well. Thus, the preparation of the building energy conservation code in 2007 can be viewed as a step that has been taken out of this legislation itself. However, India is yet to achieve the goals laid down in the building energy conservation code. Factors as varied as the territorial vastness of the country, the strength of its population, are some of the various reasons why implementing these codes and standards are complicated in a country like India.

The Introduction of Multiple Distributors by the Electricity Act of 2003

The Electricity Supply Act of 1948 came to be overridden by the Electricity Act of 2003. The Electricity Act of 2003 was drafted with the purpose of reholstering the power sector of India, making it more powerful in the process. The main task of the Act was to strengthen existing legislations in the power sector and to further develop the laws pertaining to it. The liberalisation process of the electricity sector of India was strengthened further with the

passage of the Electricity Act in the year 2003. The Electricity Act of 2003 shifted the mechanism of the power industry of india. Where earlier the priority of the power sector was attaining social objectives, now the focus turned towards maintaining economic viability of the sector. The economy of the power sector, as has been discussed earlier, even with its focus being in the upliftment of the agricultural sector of the economy with assistance in the form of subsidies, had led to a decline. The situation had become unmanageable, where the State Electricity Boards faced uncontrollable losses. The Electricity Act was passed keeping this background in mind. The Act involved all transactions regarding the production, purchase, distribution and supply of electricity in the country. The focus of the Act has been to energise the electricity sector of the country in terms of being an industry with probability of economic development and not merely as a social objective (Thakur et al 2005). The Act sought to achieve this goal by the process of active decentralisation of the process of production and supply of electricity in the country with a complex but established mechanism of control through tribunals (established by the Act), so as to not ignore a robust system of subsidies to different sections of the population.

The Act also introduces the mechanism of a multi buyer system contrasting to the single buyer system that existed before. According to this, where earlier the private sector involvement was limited only to the production and supply sections of the sector with the state's unprofitable involvement as a middleman in the form of the transmitter, came to be changed towards a model whereby private entities were involved in every step of production, transmission and distribution of electricity to the consumers (Thakur et al 2005). While the involvement of private capital in the electricity sector might bring in dilemmas in the form of whether a profit making venture can ever be beneficial towards social development of consumers (given electricity is a basic amenity in modern times and is intrinsically tied to the wellbeing of individuals and households, and the electricity sector in India before liberalisation came to be viewed as a social project with the aim to reach the

same to all), this Act's introduction of the multi-buyer system ensured that the consumers could at least now have a choice of purchasing electricity from multiple sellers with competitive electricity tariffs. This would be a possibility at the end of the consumers to choose from the multiple distributors based on the tariff rates they provided of electricity. This can be viewed as a progressive from the perspective of bringing down the gap as far as affordability of a household is concerned. The option to choose electricity from any one of the multiple distributors thus gave the consumers the liberty to avoid being charged more on their access to electricity as well as provide them with some mechanism to adjust the share of the household budget spent on accessing this. This negotiation via competition between the consumer and the supplier might in the long run also act as a deterrent to unfettered price rise of electricity. Again the Act has brought a theoretical halt to the licence regime of the state in the electricity sector with the possibility of providing multiple licences to interested private parties, subjected to the regulations and supervision of the Central Transmission Unit (CTU) or the State Transmission Units (STU) (Thakur et al 2005) is allowed by the Act. It must be noted that while the government does not involve itself vide the Electricity Act of 2003 in the business of the electricity sector in general and the electricity trade between regions and states and the central grid in particular, control, and regulation of the transmission, as par this Act is been distributed between the National Load Dispatch Center (NLDC), Regional Load Dispatch Centers (RLDC) and the State Load Dispatch Centers (SLDC), wherever necessary. This way, the regulation of and the control of electricity transmission and its continuity in India still remains in the hands of the relevant governments, be it the center, or the state (Thakur et al 2005). This way, the government, even maintain its control over continuity of electricity supply to the consumers in India.

Learning from the mistakes of the pre-privatisation era, which featured demetering, propelling rampant power theft, the Electricity Act of 2003 made metering of electricity consumption mandatory for all customers. Privatisation or not, as has already been explained earlier, it is essential for a country to

understand how much energy is spent by it in different sectors of the economy, or in the households of the country, even while a robust system of subsidy is provided to relevant poor sections of the society. Further, to protect a customer from indiscriminate charging of electricity by a licensee, the Act empowers the relevant authority of the government to impose fines on the latter. Also, power theft has been brought under the ambit of the Act enabling the government to take rigorous action against individuals involved in the same. However, in terms of environment protection, the Act is inconclusive and does not lay down its tenants regarding the same. Keeping the above in mind, it must be observed that the government of India, through the Electricity Act of 2003 tried to address some very relevant sites of contention in the power sector of the country. It was drawn in the backdrop of the failure of the electricity sector in generating in business, and failing to extend connectivity to a large section of the population to the power grid of the country. On the other hand, after the liberalisation of the power sector of India, the greatest anxiety that the consumers faced was apprehension with regards to the involvement of private capital with profit motive posed contrary to the ideals of accessing affordable energy by the former. The Act has tried to address both the concerns via a middle ground, where private capital is involved in production, transmission and distribution of electricity, but their activity (read rise in tariff of electricity) is controlled by the competition mechanism of the market, in turn protecting the customers from indiscriminate price rise of electricity. However, the Act has not been clear on how to deal with the rise of a handful of companies that are involved in the electricity sector yielding tremendous power in the long run, both financially as well as politically (Thakur et al 2005).

Integrated Energy Policy of 2006 and its Implications

The Integrated Energy Policy of India laid down some specific goals for the country to achieve with respect to ensuring energy security and specific measures to achieve those goals. The main aim of this policy introduced in the intermediate years of 2000s was (as the name suggests) to integrate the

composite energy demands India as a country and rationalise the prospects of its energy supply concerns both in the domestic setup as well as abroad. The focus of the policy has been to strategise India's energy policy towards more efficiency, development and sustainability. The vision of the policy has been to explore the energy production capacity of the country within its domestic boundaries as well as assess its energy stakes abroad. This policy is a theoretical projection of energy capabilities of India in the near future that tries to figure out the energy security scenario of the country in a large perspective. It must be kept in mind that this policy makes an attempt to speculate the energy security scenario of India in tangible terms, so as to be able to build in mechanisms in future to strengthen the energy situation of the country. It takes into consideration the possibilities to reach power in distant sections of the country and tries to come to a palpable conclusion as to when the marker for universal electrification for a developing country like India would be. Based on assessment arrived by the policy initiative, the intention is to understand the real capability of India in achieving energy security in absolute terms. Not only this, the purpose of the policy is to successfully project identify problems in the energy sector of India and strategize to successfully remove them in the near future. In the same light, the attempt of the policy is to chart out energy conservation possibilities in the energy sector of India in an integrated manner so as to achieve an overlapping system of sustainability in every section of the same. This means, the intent of the policy is to achieve an ideal mix of energy in India that ensures security from abrupt energy vulnerability. In the same token, the integrated energy policy aims to invest in research and development in the field of energy so as to make energy more efficient in the long run for domestic use.

Draft Renewable Energy Act of 2015

The Draft Renewable Energy Act of 2015 has been brought into the legislation of India under the auspices of the Electricity Act (Amendment) Bill 2015. He bill has still been proposed, is continued to be analysed at the draft level and is yet to be passed by the government of India as an Act. As the name suggests,

the main feature of the Act involves focus and highlight on the stimulus towards including renewable energy into the mainstream energy mix of India. The purpose of the bill is to assess the possibilities of including renewable energy not only in the generation of electricity but also in the transportation and heating/cooling section of the country. The Act aims to lay down an elaborate mechanism to make the above possible through the proposed establishment of regulatory bodies to oversee the entire process, installation of institutional structures to inspect the operation, and chalk out extensive plans to establish funding structure to manage and bolster the system, so as to maintain a sustainable balance between the ecosystem and policy framework. The proposal is also to accommodate both the central government and the various state governments in the process of introducing renewables in the energy sector of India. The motion is also to lay down a clear cut road map towards achieving the above goal. The bill intends to set up a national think tank at the level of renewable energy in the form of the National Renewable Energy Committee, a National Renewable Energy Advisory Group, and a Renewable Energy corporation of India for this purpose.

The National Energy Policy and Plan 2017

Right in the opening line of the Draft National Energy Policy of India (DNEP), which was published in June 2017, the importance of energy to a country has been appraised, assessing that around 300 million people in the country are not connected to the electricity grid and 500 people continue to use biomass for cooking purposes, and its reciprocity with the Human Development Index (HDI) has been recommended, (NITI Ayog 2017). This must be viewed in the light that India is both the third largest producer and the third largest consumer of energy in the world. It must also be understood that India's capacity to generate power in the modern times have been extraordinary by standard of being a developing country. This projects the positioning of the requirement of a comprehensive energy plan by the government of india in order to correlate it to the energy security of the country which is rather commendable viewing it from the perspective of

alleviation of energy poverty, showing intent within the government. Whether that can be transformed into an active political will remains a question to be investigated. What is commendable in this approach is that the political intent of the draft energy policy points towards both the existence of energy poverty with frequent power outages in areas of the country with access to existing power grid in India as well as attempt to provide a direction towards the energy efficiency when there are reports as to the existence of surplus power generation in the country at the flip side of energy poverty, as claimed by several news reports in 2017. The problem thus lies not with the capability of the country in the generation or production of electricity or power. The obstacle lies in the ways to distribute power to the masses of the country.

As charted in the national energy policy of India, the government not only plans to electrify all villages by 2018, but also achieve 'universal electrification' by 2022 with continuous, uninterrupted availability of electricity for all hours of the day, expecting colossal upswing in energy consumption in the country by 2040 (Kumar 2017) (NITI Ayog 2017). The main aim of the energy plan as prescribed by the draft policy is to build sustainable energy options for the consumers of the country over an achievable period of time and also maintain the economic growth of the country. This approach does not alienate, in theory, energy poverty with the economic growth of the country. What it does in the process in fact is to coagulate the energy demands of the country, the affordability of energy needs of the consumers of the country with the need to maintain the economic growth of a developing country. This ties the aspiration of the citizens of the country vis a vis their energy demands, affordability in accessing energy for their day to day functioning, energy efficiency and the economic growth of the country. While recognising that the demand for energy in India is slated to grow almost four fold in the next few years, an interesting take on maintaining the demand of energy as well as ensuring sustainability of energy access is seen in the draft energy plan, via the plans to bolster the generation and distribution of renewable energy as well as plan in reduction of oil imports of

the country by a tangible amount of time (NITI Ayog 2017). It has been projected in the draft national energy policy that the share of renewable non-fossil energy in the energy mix of the county is to be increased by almost 40 per cent by 2030, gradually from a target achievement of 175 GW of production by 2022 (NITI Ayog 2017).

Again, via the DNEP, the Indian Government has come to a decision to adjust and coordinate energy prices with its international prices (Sharma 2017). This does give a greater chance of the government to maneuver with the changes in the energy market in the country in tandem with international market prices of the same and provide accommodate policies and create room for adapting to these changes (Viswamohan and Chawla 2017). This can however be viewed from twin perspective. As has been identified before, the involvement of foreign capital in the production and distribution of any form of energy to the Indian consumers might be detrimental in the long run in ensuring energy security, because of the automatic rise in prices of the same when subjected to market competitiveness which does not in fact increase choices of the consumers towards sustainable energy, but have pushed them towards more unsustainable but cheaper sources of energy. However, on the other hand, it has been identified by the DNEP that the present mechanism of the government of India to target provide subsidies to the population who are most affected by price rise in energy, like it has been in the case of providing subsidy for LPG, shall continue in ensuring accessibility of energy to the most vulnerable part of the population of the country (Sharma 2017).

Given all the above, this publication has been criticised for lacking in tangible strategies to meet the end that it both predicts and projects despite making a credible assumption of the map of the energy poverty situation of India as well as understanding the sustainable energy production capability of the country (Tongia and Ali 2017). For having a sound understanding of a situation and a credible knowledge of the wherewithal for the future does not guarantee that a satisfactory end to the problem can be met, if there is not a well chart out and appreciable blueprint and design of achieving the end is attached with it. This

has been where NITI Ayog's blind side has been located by critics with an assumption that integrated approach towards eradicating energy poverty must involve more than a top down approach to the problem (Tongia and Ali 2017). The basic argument of attaining energy security in a developing country like India, as has also been laid down in this thesis, has been to both identify energy security from the perspective of energy poverty of the consumers and chart out possibilities to eliminate it through tangible methods. The DNEP also thus gets trapped in the same quagmire that it probably must have wanted to avoid, by missing to look into the possibilities of individual demand sectors and possibilities of decentralisation in the mechanisms to produce and distribute sustainable and affordable energy at the local levels of the population and consumers of the consumers of the country (Tongia and Ali 2017). Also, while the possibilities of inclusion of renewable energy in the on-grid electricity mechanism needs appreciation, the DNEP stays mute as to how that feat must be achieved. In the same token, the prospect of establishment of off-grid installations of renewable energy generation has not been emphasised enough in the DNEP. This lack of clarity in the larger context might lead to discouragement to the over all development of the renewable sector as whole, where there is inadequacy of recognition to context specific electrification programmes, keeping in mind the fact that even while majority of villages in the country while are connected to the electricity grid, do not have access to good quality of electricity (that lacks in power outages and fluctuating power voltages) (Viswamohan and Chawla 2017).

The DNEP has also mentioned in great detail the possibilities of harnessing new methods to universalise energy access to a larger population of the country. However, critics point that the document seriously lacks in identifying mechanisms to improve and thus bolster already existing instruments of distribution and production of energy in place (Tongia and Ali 2017). What needs to be understood in this regard is the fact that it is not the lack of supply that has plagued the indian energy sector in the recent times. As the reports of having surplus production of energy has been recorded in the

year 2016, the focus of doubt regarding the energy poverty situation of India has shifted to the distribution junctures. The problem with securing energy in India has shifted from whether energy is being produced to whether it is being distributed to the consumers in a more efficient, sustainable manner. Whether the consumers have been able to access affordable, inclusive and sustainable sources of energy is the main focus of understanding energy poverty in India. Also, whether the targets set by the DNEP are achievable can also be question with regards to not specification of alternatives to situations existing now regarding the taxing and pricing mechanisms in practice in the country. As critics point out, that almost 3 percent of the national Gross Domestic Product (GDP) of India is generated from levying taxes and cesses on petrol and diesel, if there is to be a sharp decline in the prices of crude oil (Viswamohan and Chawla 2017). While the DNEP essentially points out targets to decrease dependence on them, it does not explain whether or how that would affect the GDP of the country in future (Tongia and Ali 2017). Similarly there is no mention of budgetary allocation for the energy sector in general and each section of the sector particularly in the DNEP. Also, while there has been discussion as to the possibilities and commitments to possibilities to invigorate renewable energy sector in the country, the projected increase in the dependence on and demand in coal in the coming years accepted by the DNEP clearly goes against the idea of building a sustainable prospect for energy choices for the consumers (Tongia and Ali 2017, Tharoor 2017). This extent of reliance on the power sector might in turn demotivate and discourage the investors on renewable energy sector, even the market reality points towards in fact the weakening in efficiency of several power plants at present in the country (Viswamohan and Chawla 2017). Even while compliance regulations to environment regulations have been imposed on the functioning and regulations of emissions of thermal power plants, the projected reliance on the thermal sector is likely to defer the compliance to December 2019, hindering the process to achieving emission goals in particular and environment goals in general context (Viswamohan and Chawla 2017). Without the above given due credence and chance, the DNEP fails to generate any logical conclusion to

the ambition projected in the same (Govindan and Palit 2017). As it has been pointed out by scholars that mere stating of rules and regulations, and laying down of broad approaches do not suffice in taking care of energy poverty alone with increase in lack of clarity. There is the urgent to ensure energy justice in the documents of the government of the country. If the same is not done, often ambitious plans do not lead to expected outcomes, like linking condition of gender to energy policies of the country (Govindan and Palit 2017).

Contribution of Subsidies to Consumers in India in Alleviating Energy Poverty

Fuel subsidies make it easier for the consumer to select from wide range of energy sources available in the market. Subsidies are made available by the government to choose the most efficient energy to fuel the consumer's energy needs. That way, energy subsidies to the consumer help the latter make a more sustainable choice while selecting energy for its household needs by making the price of the viable energy source more affordable to him/her making it cheaper than its price in the market. Keeping this in mind, it is rather a duty of the government of any country to give its consumers subsidies both in direct as well as indirect form.

However, the trend of developing countries who have been signatories to the Paris agreement has been towards providing subsidies, both direct and indirect, in popularising the use fossil fuels in the form of oil, gas and coal. Critics are of the opinion that this trend is in fact in antithesis to the Paris Agreement itself, which deals with the reduction of the worldwide emission of greenhouse gases, given combustion of fossil fuels add to the same (ADT 2018).

There is also argument that subsidies provided in promoting fossil fuels have not really affected in alleviation of poverty in the developing countries. Data suggest, that for example in India, despite the spending of about USD 22.5

billion in 2010, around only 20 percent of the poorest of the population have been able to benefit only about USD 2 billion from it (ADT 2018).

The Energy Sector of Brazil

The brazilian energy sector is managed by the central government of the country. The regulation and maintenance of the sector is the charge of the federal government of the country as per the constitution of the country, which is in stark contrast to the indian energy sector regulation. Under the present constitution of Brazil which came into function in 1988, there are several legislations guiding the energy sector of the country, restructuring it towards the involvement of the private sector. The energy sector of Brazil in general and its electricity sector in particular is the largest electricity sector in the entire south american region. It is interesting to note that a major chunk of the electricity sector in Brazil (around 65 per cent)is dominated by hydroelectric power. Scholars have reckoned Brazil to be an energy giant (Xavier 2015). The mention of the electricity sector of Brazil is directly found in the constitution of the country. The electricity sector of Brazil is regulated by the constitution of Brazil, whereby 'the sector can be exploited directly or through authorisation, concession or permission' (Schmidt et al 2018). The comprehensive handling of the electricity sector of Brazil is guided under the auspices of the Brazilian Ministry of Energy and Mines. The ministry is responsible for the maintenance of the sector setting it its directives through its policy initiatives. It must also be noted that the sector has been open to privatisation and foreign investment to a large extent. A set of laws as noted down in the constitution of the country guides the performance and functioning of the Brazilian electricity sector.

The Power Concessions Laws of Brazil, which have been formulated in the year 1995 lays down the rules and regulations that the electricity sector of the country is modelled into. The law also lays down in great detail the procedure for both public owned companies and corporations to access public service, under which the electricity sector falls. The power concession law to be

particular falls under the overarching Concession laws of Brazil, that has also been laid down in the same year (Schmidt et al 2018).

The Brazilian Electricity Regulatory Agency or the National Electric Energy Agency (ANEEL) also came to be set up in the following year of 1996 in Brazil. The main function of ANEEL is to be the liaison between Ministry of Energy and Mines and the government of Brazil. It is the Ministry of Energy and Mines that is responsible for granting concession to companies for the production of electricity in Brazil. While the Ministry grants these permissions, it is the ANEEL's undertaking to oversee the management and supervision of these concessions to corporations and public companies alike. If there is any conflict that arises between the licensees, and concessionnaires, it would be resolved by the ANEEL. In short, the main exercise of the ANEEL is to command the smooth functioning of the electricity sector of Brazil by managing the public tenders to the electricity market of the country. The ANEEL also decides on setting up tariff rates for electricity.

What is interesting in the case of the Brazilian power sector is that both private as well as public entities function in close coordination with one another for the successful functioning of the electricity sector. For example, though ANEEL happens to be the ambient regulatory body that administers the functioning of the power sector, there are subsidiary bodies which see to the functioning of the sector, essentially not being a publicly owned, non governmental organisation, like the Operator of the National Electricity System (ONS), which acts as a regulatory body, functioning to monitor the coordination of the national grid. It was created in the year 1998. Also, the Power Commercialisation Chamber of Brazil as well as the Power Research Company which regulates the electricity market of Brazil and make future long term policy initiatives for the energy sector respectively, function under the supervision of the ANEEL. These latter has been established in the year 2004. Other than the Ministry, bodies like the National Council on Energy Policy (CNPE) and the Committee for Monitoring of the Electricity Sector also play an important role in the regulation of the power sector. They look

into long term policy making for the sector as well as prepare for disaster situations or calamities that might have heavy bearing in the supply of electricity. For example, the Committee for Monitoring of the Electricity Sector has been created after the heavy drought in Brazil in the 2000s that lead to rationing of electricity in the country. The present task of the organisation is to audit the supply of electricity and recommend suggestions that would prepare the country and the electricity sector for situations that might lead to insecure situations (Ladeira et al 2016).

The Brazilian power sector was open to private investment in the 1990s, where it underwent massive restructuring that went on well till 2004. The power market in Brazil is bifurcated into two sections, the regulated power market and the unregulated or free power market. While the major source of electricity in Brazil is garnered from hydropower sources, in recent times, involvement of renewable electricity has also been encouraged by the government. Even while the electricity market might seem to be highly deregulated, not any private entity can enter it. Private companies need to be delegated by the government of Brazil to earn such position. That way, the federation of Brazil still holds considerable authority over the involvement of the private sector in the energy market. In case of hydropower generation, interested parties would have to participate in auctions organised by ANEEL to win a place in the trade (Ladeira et al 2016). Even in case of companies that are interested in investing in small hydro power plants, the process of access is through regulated competitive interaction with the Ministry of Energy and Mines and ANEEL. In the case of generation of power through nuclear fission, private investors are forbidden from the same. The government has absolute autonomy in the control and generation of electricity from nuclear (Ladeira et al 2016). On the other hand, the operation and electricity generation from hydropower sources, according to the Brazilian law must be in the hands of Brazilian citizens. It is not open for investment from foreign sources. In case foreign country want to participate in the same, it will have to be done in collaboration with a domestic concern. Further, power generation companies

are strictly delineated from supplying companies, so as to discourage accumulation of massive profit in the hands of few private entities and dissuade monopolisation of the sector (Ladeira et al 2016).

Brazil has codified access in a legal framework and has pursued the implementation of electrification through several programs, notably the Programa de Desenvolvimento Energetico de Estados e Municıpios (PRODEEM); Sergio de Salvo Brito Reference Center on Aeolian and Solar Energy, 2008; Luz no Campo, 2008 and Luz para Todos, 2003. These programs deal essentially with the progress and impetus towards the propelling of renewable energy in Brazil. PRODEEM was set up ensure circulation and distribution electricity to far away and remote places in Brazil that are not connected with the central electricity grid in the year 1994 (Galdino and Lima 2002). It centered around the promotion of solar energy in these far remote households initiated by the government of Brazil and was one of the flagship projects of its kind. The different phases of PRODEEM took lessons from each other and established itself to be one of the premier examples of solar system set up in the off grid modes in developing countries of the world. The current stage of the programme suggests the involvement of local municipalities and communities of citizens. The involvement of local communities have always been deemed by scholars to encourage personal involvement with power projects, propelling further sustainability in the process. The Luz para Todos campaign started in the year 2003. It was the flagship process to encourage speedy electrification of the rural areas of the country. It is thanks to this project that Brazil has achieved almost 100 percent electrification within the ambit of its country. While the aim of the project was to supply electricity to over one million households by the end of 2008, the programme almost achieved it by providing electricity to 4.6 million people by the end of 2006 (IEA 2017). When loosely translated, Luz para Todos would mean ‘light for all’. After ten years of the programme, it has been estimated that around 15.3 million people has benefitted from the luz para todos programme (Camargo and Ribeiro 2015)

The Energy Research Company (EPE) of Brazil is a company in Brazil that acts as the eyes and ears for the Brazilian government in understanding the energy sector of the country. The EPE conducts relevant researches viable for the breadth of the country, feeding the state of Brazil on what is the practical situation of the sector in question and assist them towards applicable and viable policy initiatives to be taken updated to the situation. The EPE reports to the Ministry of Mines and Energy and draws its finances from the national budget of the country and came to be created by the Brazilian National Congress Law 10.847 in the year 2004, assessing the possibilities of inculcating the ideals of sustainable development as a major responsibility to deal with while the government formulates policies catering to the energy sector in general and the electricity sector in particular (http://www.epe.gov.br/pt/a-epe/quem-somos).

It must be considered that considering Brazil is a developing economy, the structure, system of the energy sector of the country is quite complex. There are some problems when it comes to implementing institutional mechanisms in handling distribution and production of energy in Brazil, making achieving long term plans of increasing the sustainability of the energy sector fall short at times (Swedish Agency For Growth Policy Analysis 2013).

Conclusion

While comparing the energy sectors in India and Brazil in general and the electricity sector in particular, it is worth mentioning that there are some stark differences between the two. The main contrast lies in the functioning of the two sectors. In India, the electricity sector has come to be heavily regulated by the government and state authorities since its independence. The energy sector, as a whole, has always been viewed as a zone integral to the development of the country in entirety. The purpose of the sector has been to provide subsidised electricity to the consumers, a teeming section of who lie under the poverty line, especially right after the independence of the country,

when it emerged as a news section. However, over the years, the lack of long standing tangible policy initiatives on the part of consecutive governments of India, the energy sector, as well as the electricity sector came to oversee heavy loss due to lack of proper, rigorous regulations. It is only after that first phase of heavy involvement of the government and its subsequent unsuccess did the state decide to privatise the sector and deregulate it to a large extent. Even when today, the sector marches steadily towards further involvement of private capital, the involvement of the government remains crucial towards providing it proper guidance. The overall policy making initiative of the electricity sector including price regulations, even while subjected to market based adjustments, remain the concern of the government of India. In case of Brazil, the situation seems a tad bit different. Just like India, while looking from the top, it will be evident that the electricity sector of the country has almost the same trajectory as India. The Brazilian electricity sector came to be liberalised in 1997, few years after India. However, the extent to which it has been privatised is considerably wider than the situation is in India. There is almost complete deregulation in energy trade of Brazil by the government. All the major power generation corporations of the country are privately owned and regulated. Even then, the overarching control of the sector remains under the auspices of the government. What is distinct in the case of Brazil interestingly, and might as well be deemed to be the reason behind the success of the power sector of Brazil, keeping in mind the fact that the country has achieved 100 percent electrification, including in the remotest areas, is the fact that the power generation sector, especially in its regulation in more ways than one involves non profit making non governmental bodies, organisations and communities, that participate in equal footing with the government in the functioning of the sector. This is an interesting mechanism through which Brazil has ensured that the power sector does not remain the concern of the government alone or the become the machinery to generate profit for private entities alone. The involvement of non-governmental organisations have brought in concerns previously overlooked as well as sought to take a middle path towards providing accessible energy to all. The last and the most

interesting part of the brazilian power sector is that while its largest power production capacity is around hydroelectric power, despite being open to private investment, it has been limited to investment from citizens only. This is an interesting way to encourage participation of private capital, but also ensuring that the earnings from the sale of electricity does not leave the domestic market of the country.

Chapter 5

Implications of Energy Poverty on Energy Security: An Assessment

Ban Ki-moon said in a 2014 speech to Clean Energy Ministerial Meeting at Seoul, South Korea, "Energy is the golden thread that connects economic growth, increased social equity and an environment that allows the world to thrive" (http://www.cleanenergyministerial.org/sites/default/files/2018-07/CEM5-MessagebyUNSecr-GeneralBanKi-moonMay2014.pdf). This is a cardinal idea that this research believes a country should cater to while formulating its energy security. There are three central takeaways from the above section of Ban Ki-moon's speech. Firstly, the fact that energy security must be analysed with respect to the economic growth of a country is something that has been emphasised again and again by scholars. It has been used to the extent that ensuring economic stability from securing energy has mostly been the sole perspective and goals of countries.

However, the charm of the statement lies in the second part, where Ban Ki-moon states that not only does energy connect to the economy of a country, but also has a considerable impact on the enhancement of the social equity of the country. Besides many things, social markers of a country are contributive to the well-being of its citizens. It is essential thus, to note that energy security of a country does not limit its impact only on the economic sphere. It has a long-lasting impression on how energy is used in a person's daily life to enhance the prosperity of citizens, contributing to the basic accomplishments of human life. This is the basic essence of the thesis in question. The research has tried to explain the possibilities of exploring the appreciation of the concept of energy security via the prism of common experience and the knowledge derived from it. In that perspective, it has been observed, that the experience of the citizens in accessing energy has been via abject energy poverty. Energy poverty, especially in developing countries, for example,

India and Brazil, which are also the subjects of this study, have emerged as a deterrent towards the realisation of energy security goals at the personal household levels of the citizens.

On the other hand, the character of energy poverty in the two countries that have been dealt with in the research has brought forth some interesting complexities and elaborations. These two countries with varied social, political and economic makeup, even while having an almost similar economic trajectory, has presented a different meaning and perspective to energy poverty. While energy poverty in India has predominantly meant the lack of access to energy, In the case of Brazil, the energy poverty scenario expansively pointed towards the lack of affordability of energy for the population of the country. These are two essential perspectives that have contributed to a wider decipherment of the concept of energy poverty, to deal with. Thus, while it is essential to again go back to the excerpt from Ban Ki-moon's speech, these variations to the concept of energy poverty will bring to the surface such variations to the widening of the concept of energy poverty in particular and energy security in extension.

Looking into the third and the last section of Ban Ki-moon's speech in question, one must marvel at the distinguished way the proponent has tried to mould the idea of energy security through exhibiting the concept contributive towards an environment "...that allows the world to thrive". Through this declaration, Ban Ki-moon can be viewed as projecting a scenario whereby the understanding of the concept of energy security, where it subsidizes the realisation of the wellbeing of individuals.

Energy poverty as a concept, here again, can be brought into the focus of discussion, albeit with new extensions. Beyond an introduction to the concept itself, the debate here alludes to a now very ripe concept of energy justice into the platter of discussion as well. The concept in itself refers to the absence of choice, that further reduces the options of participating in and controlling of institutions, that effects the development, in its real sense. That is, when

energy security is to be discussed, it is essential to note how the institutions that affect the security of the same, can be influenced by the unit of inquiry. It is important to note here, that the idea of energy poverty is simply not meeting the demands for energy services but also ensuring that equitable amount of relevant and sustainable energy is made available to the citizens.

Energy Poverty Debate Leading to Discussion on Energy Justice

Sovacool is the prime proponent of this idea, that pushes the boundaries of energy security a little further. Since the expansion of the concept of energy security, there are several related areas of inquiry, that has been brought into the discussion. They are the concepts of energy production, distribution, energy policymaking, climate change and energy activism (Jenkins et al 2015). The idea of energy justice has been applicable to a lot of the debates that involve the interactions between these proponents. The argument begins with the presupposition that energy as a resource is scarce and coupled with the unpredictability of the environment that we live in, the access to these resources has come to project international struggle, which, in many ways, have not been resolved with mere trading. Even while considering international trade, it is a given understanding that the locus standi of two trading partners, in the world are not always level. Each country comes with their own set of bargaining chips to the table of negotiation while trading for energy resources. Even in resource-rich countries, access to energy largely depends on the power balance between the ruling class and the citizens. It is then the energy policy of the government in question that determines how access to energy for the citizens is ensured.

In this background, the question of energy justice brings in the idea of energy activism. It tries to portray energy poverty as a real situation that the citizens of a country live in, especially in a developing country and the ways in which this dictate their access to useable energy for the realisation of well being. Thus, energy security ceases to be merely a conglomeration of supply and production of energy. It rather becomes a concept where one is laboured to

look into the emerging insecurities of the society in question and reflect how that influences relevant access to the energy resources (Jenkins et al 2015). Keeping the above in mind, Sovacool (2014) urged scholarship to involve a more humane approach to understanding the problems at hand in relations to energy security, whereby the bone-dry concept shall be made rich with the realities of human experience and the latter will be taken into account while formulating relevant, admissible and inclusive change in the making of energy poverty. It is the concept of 'fairness' that drives the concept of energy justice (Sovacool 2014).

It is rather a normative study to investigate the linkages between energy poverty and energy justice, leave alone linking the latter with energy security. The main premise in which the theory of energy justice emerges is the question of whether there are injustices in a society that affects access to energy. The questions of access to energy, the social standing of an individual and a household that affects the access of the same to energy, the rising price of power and cooking gas are all features that create a situation and an environment that gives rise to energy insecurity in the lives of individuals and households in a society. A larger and deeper investigation into these factors might give one a better idea into the nuances of energy poverty in particular and how it affects energy security of the country. This is essentially been categorized by scholars as distributive energy injustice (Jenkins et al 2015). Similarly, how the government of a particular country has chosen to influence the access of energy to households is something that has been viewed as procedural justice, whereby, it has been viewed as the responsibility of a government to take into consideration not only the basic energy needs but also the energy aspirations of a household, while formulating energy policy initiatives at the central level (Jenkins et al 2015). Lastly, the social positioning of an individual and their household in extension in most cases determine access to equitable resources in any country. In terms of energy, scholars have defined this as determining a recognition- based justice structure for determining energy poverty (Jenkins et al 2015). These are the parameters

in which the energy security of an individual and their household can be successfully and objectively etched out.

The Implication of Energy Access on Energy Poverty

Rural electrification is the most common method through which households, especially rural, are extended access to energy (more relevantly, power). It has been observed that over two-thirds of Laotian households enjoy access-to-grid quality electricity, post-1995, where one of six families have access to electricity. This has been possible due to the government initiative of prioritizing access to rural electrification in their National Growth and Poverty Eradication Strategy (2006-2010). Why this country is mentioned in the beginning of the discussion is to highlight that there have been many similar means achieved by several developing countries, which have been traditionally viewed as the locations where the access to energy is the poorest, affecting energy poverty of a large section of the population. It is essential to take a cue from the above to chart out the ways in which one might build an academic study on establishing the linkages between energy access and energy poverty, and energy access and energy security in extension.

When there is a discussion on energy access, it must be made clear that energy access might start with the lighting of a singular bulb in a household, but it expands to a large spectrum of accesses, that has implication on social movements of the household, their access to other facilities like education and healthcare. Defining energy access is one of the key components of this problem. Thus, while defining energy access and energy poverty in extension, there is the need to level the playing field, because the situation is not the same for everyone.

Also, it is also a matter of relevance to note that where and how the government chooses to exploit the natural resources of a country, remains to a large extent the prerogative of the government itself. It depends on what the government observes as the priority for the allocation of energy resources. If it is the economic and industrial sector, which is at the sole receiving end of

energy, then it has to be observed, how much does this allocation affect energy access to the common households of the country. In India, for example, right after its independence, the government focused heavily on the industrialisation of the country, to pull its economy back from centuries of colonial economic depression and exploitation. With successful industrialisation, over the next few decades, the focus of subsequent governments shifted towards rural electrification. Since the initiation of that process, there have been several benchmarks achieved in accomplishing rural electrification in a country as large as the territory of India.

The territory of the country in a subject, thus, is also important to be kept in mind while formulating the nuances of the energy access and energy poverty debate. The terrain a country is familiar in determines the relevance of the main electricity grid and access of the citizens to it. For instance, in India, as the research has found, there is a considerable area which has so much complicated terrain that it becomes almost impossible to extend the central electricity grid to those areas. It is the NorthEastern part of the country, for that matter, that needs to be reviewed in this context. Similarly, in Brazil, the large Amazon base of the country is the region, where it is the hardest to control the access of the people residing in that area to energy resources of the country and the electricity grid in general.

In the same context, while it is generally presumed that deregulation in power generation and distribution would logically lead to expansion of reliability of access to energy with greater efficiency, especially appendaged with it the supposition that it would increase the choice for household consumers, experiences of various regions across the globe has proved that the fact, in fact, remains a myth. Also, the argument remains as to what good does choice mean with respect to the fact that the price of power in either of the choices remain high. Thus, what are the prerogatives that need to be kept in mind, that affect and influence energy choices in real terms? These are questions that

need to be postmarked in detail while addressing coincidences between energy access and energy poverty.

Very commonly, the energy access and energy poverty debate have been limited to energy access viewed from the perspective of general poverty status of the household. That is, the income of a household has been observed as a determining factor while discussing access to equitable energy. However, such a perspective might lead to a confusing analysis, for more reasons than one. It has been found in the research, that not always do the rich, who have regular and a secured source of income and stable employment, do make the right choices with respect to energy. Lydia Powell observed in the interview given to the researcher of this study that there are cases of richer households living in quarters far larger than required for the set number of people in the household, in India, for that matter. Subsequently, their expenses incurred in the maintenance of the living quarters of the household are also more than the expenditure of the average household. In the same token, the expenses incurred the access to energy, is far more than it might be relevant to an average household. In a middle-class household in India, for example, the members of the household have a tendency to develop creative mechanisms to bring the overall expense of the household down. For example, in households with Air-conditions, instead of having multiple fo the same in all the rooms of the living quarters, the members of the household might choose to utilize the air conditioner in one on the bedrooms and accommodate sleeping arrangements of all the members of the household in that room itself. This might again be possible if there are around on an average 4 members in that household. That might not be possible with a further increase in the numbers of members in the household. In a similar context of a comparatively richer household, each member of the family might have separate bedrooms with separate air conditioners to cater to the cooling of the room. Also, in a middle-class household, the amount of time the air conditioner in question is put to use might be far less than it is put to use in a richer household. This elaborate observation is explained for the purpose of bringing in the point that

the choice of expenses to be incurred in a household on energy depend on various patterns and living and consumption traditions of an average household in a society. Also, in this context, it must also be observed that having a certain amount of money coming in as income does not guarantee responsible spending of energy. Often, in a developing country, where the choice of sustainable energy is levied on the poor, it can be observed that the income of the household does not have so much to contribute to the alleviation of energy poverty.

Implication of Affordability of Energy on Energy Poverty

Further, as observed earlier, a mere increase in the access to energy is not something that is going to eradicate energy poverty (Casillas and Kammen 2010). Most academic literature on the significance of the availability and the affordability of energy as a primary factor determining energy security of a region. Emphasis on the generation of sufficient, uninterrupted supply of energy with minimized foreign dependence on accumulating energy is of primary importance to developing countries. It has been observed that growing dependency and the lack of domestic supply of energy has resulted in the generation of international conflicts. Both diversification and the prevention from sabotage of domestically generated energy is of primary importance in developing different aspects of energy. Families with limited access to energy, in developing countries, are seen to spend a larger proportion of their income on energy services. The prices of energy fuels and services should be stable to ensure the affordability of energy, in developing countries. A final dimension to the affordability of energy is the availability of high-quality fuels and services. The World Health Organisation and United Nations Development Program categorises access of energy to an ‘energy ladder’, that enlists access to electricity in the topmost rung, as opposed to access to traditional fuel in the bottom rung of the list (Sovacool & Brown 2010)

Affordability factor of energy access is something that needs to be also paid equal attention to, in order to maintain the goal of the eradication of energy

poverty. There need to be questioned, as to how much of a household's budget, when spent on acquiring energy, can be sensibly taken to be the 'affordable' limit. /some studies proclaim that when about 6% of a household budget is spent on the electricity bill, it can be touted as affordable. But, the context of such research must also be viewed. The context of the country that is to be researched, that is to be the subject of energy study also needs to be elaborated. Only then can the affordability factor in analysing energy poverty and subsequently energy security can be correctly and objectively assessed.

The Capabilities Framework and Energy Poverty

The prime linkage between viewing basic access to affordable energy arises from the concept of human insecurity as well. The fundamental premise of human security lies on the presumption the security of an individual and their household does not solely rely on their bodily security. One of the last pillars of human security also states that there needs to be free from indignities of all sorts, that one should enjoy, to be able to be an individual who has achieved human security. With respect to energy, the concept of energy poverty is something that acquires an indelible position in this kind of explanation to insecurities in the human security paradigm itself. It has already been established in the research that access to affordable and sustainable energy is something that forms the basis of being a determining factor in wellness and health of the lives of individuals in a country. Drawing from that, it can be reiterated that if a household is not energy secure, it cannot be free from all existential insecurities yet. When energy, determines the hours an individual can spend indoors studying, recreating or indulging in productive capacity building, and the non-availability of choice to venture out in search of securing non-sustainable sources of energy, the options are rather clear that the eradication of such energy poverty must gain absolute relevance in the energy security policy of the government of the country in question. It is thus a non-negotiable truth that energy security of individuals in something that contributes to the building of their capabilities.

Amartya Sen in 1979 observed that when we think about quality, we are always trying to measure it in some space. And all of the disagreements are regarding what space we measure it in- whether it's in resources, liberty, justice- we disagree about the space in which we discuss equality. He proposed that we do so in the space of capabilities- which is - people's freedom, their 'real freedom', not 'paper freedom' with respect to how much they are free in a country, ensured by the constitution of the same, but real freedom, in terms of the social conditions prevalent in the country, to achieve activities and states of life that they deeply value and also they have reason to value, that is valuable from a larger perspective. It expanded economic thinking away from people's preferences and utility to their activities and their states of being and doing so leaving room for freedom so that they act as agents and create and not put them in a box and give them basic needs as in a prison.

Through the study of the scholars, it has been further established that with respect to energy poverty, while viewed from the perspective of the capabilities framework, it is not enough to look at it from the perspective of the GDP, just as it is a problematic framework to view poverty itself. Poverty itself is multidimensional (Day and Walker 2014). Similarly, the indicators of energy poverty are also something that is derived from several varied sources. There are several functions that an individual is subjected to, something that is a given to them like the conditions of being in good health or being able to maintain a meaningful relationship, attainment of education, etc. These are functions or indicators that cannot always be measured in concrete terms or be a specific measure of a good life. However, these are goals that an average individual consider important for the achievement of well-being. Capabilities, on the other hand, is a relevant situation that the individual is subjected to in order to realise the above-mentioned functions. What, for example, are the conditions necessary, in the context of the study, for the subject to realise their goals to achieve the function of getting a quality education?

With respect to energy, the capabilities framework has lasting relevance. This is because, through this framework, the focus of the study is not the income of the household or the individual, but the outcomes that are achieved through it. On the other hand, when the purpose of the life of an individual is to achieve development, the only relevant form of development they can achieve is through the realisation of these capabilities that help them achieve their functions. In the case of energy, it has been observed that the purpose of energy security, as a whole, has been to enhance the development of the individual in question. If the energy policy of a country has not been able to do that, then that cannot be labelled as comprehensive energy policy or energy security document.

Multiple Poverty Indicators and the Uniqueness of Energy Poverty

"Human lives are battered and diminished in all kinds of different ways", said Amartya Sen (1999). Largely the way poverty is perceived by people is a normative perspective and the data source is multiple. Poverty cannot be derived or determined from a single indicator- like monetary indicators, or life expectancy. Can monetary indicator proxy other non-income based deprivations, as well? Can there be different versions and definitions of poverty converge? Income is not a perfect proxy for other deprivations and variables. Measurement of monetary poverty thus is very important. But resting other deprivations solely on income poverty is insufficient. It is also interesting to observe if income poverty reduction, on the other hand, has had a trajectory of being accompanied by a reduction in other forms of deprivations (Sabina Alkire Oxford Poverty and Human Development Initiative 2014). Could one non-poverty indicator be a proxy for the main social deprivation?

It has been claimed by scholars that even while growth is not an end in itself, it is a phenomenon that goes hand in hand with the reduction in the rate of poverty in a way that nothing has ever been able to achieve, which has become sort of a standard for the way it is understood in academia and media based

perception of the concept (Michael Spence World Bank Growth Commission 2008). Economic growth does not necessarily predict the growth in other indicators (Dreze and Sen 2013).

Similarly, energy poverty cannot be merely determined on the basis of one or two factors. Monetary indicators most definitely are of importance while determining how much a household can pay for security energy for itself. However, there can not be a universal income and spending ratio that can be applied to understand energy security at the household level. Indicators determining the consumption pattern of a household also are not watertight determinants of their energy insecurity. Energy poverty can only be properly understood taking into consideration the income patterns of people residing in one region of a particular country. For example, the revenue generated from all the states in India are not the same. Some states have a larger contribution to the economy of the country than the other states. In the same context, what is the most secure way to ensure access to energy in a household of a region is dependent on local factors. As it has been explained earlier, for instance, the northeastern part of India has complicated terrain, similar to the obstacles agencies have faced in the Amazon basin of Brazil. These complications are contributive to the energy policy of the country. These are factors that have been traditionally kept in mind while formulating a comprehensive energy policy of these countries. This is thus a major way in which the factors and indicators that determine the energy poverty of a household, is contextual, and have relevant impetus on the energy security ideals formulation of a country.

The Copenhagen School of Securitization and Energy Security

Post Cold War world has seen the emergence of new definitions of security, where the debates have moved beyond the sole discussion of military issues through other fields such as economic, environmental and social issues. With the security approach of the Copenhagen School, adequate analysis of the issue of energy (particularly oil and natural gas) has been discussed in the perspective of securitization and energy security, as a broadened concept

through various approaches. The Copenhagen School makes a connection between the two challenging approaches of Security Studies, the traditionalists' approach and the approach of the widener, who perceive human security as an important element of security studies as opposed to traditional security studies of states as a static body, in totality. Gradually, the importance of energy viewed as a threat to security has been observed as a major concern at the global level. In its most basic and fundamental sense, energy has been realised to be connected to the concept of security of supply, that involves providing safe and secure transfer of energy from producer to consumer countries.

The School further recognises the unpredictable sphere of the energy market, that can be considered as a threat to the stability of a developing country. It locates the states growing interest in energy self-sufficiency in the global energy market, owing to the international anarchic order of the global paradigm. The aim of energy security is seen to provide greater self-sufficiency of state actors, owing to the survival of the states by reducing the possibilities of external threats leading to greater national security. The School further recommends broadening the strategy of taking the issues and relations out of security by continuing to accept and to the growing existential security issues in society, concerning the survival of the state. With the economy, military and technology of a developing state being highly dependent on energy, the issue of energy security has gained greater importance in the framework, altogether. The rise in demand and dependence of finite energy resources of states has resulted in the growing interdependence between the states and the context of securitization theory, as theorised by the Copenhagen School.

Thus, the Copenhagen school of securitization can be viewed in providing a very crucial basis in the perspective to understand energy security. The primacy of the theory is such that it forms the basis of a comprehensive energy security document or energy policy of a country that takes into concern the emerging energy environment of the world. It enumerates and elaborates the

concept of energy security to an extent that the nuances of the contexts of every country are to be taken into concern while determining energy sufficiency and dependency of a country. The most relevant part of the Copenhagen school is the applicability of the ideals of human security to the ideals of energy security. The school takes into consideration the current insecurities that have emerged in the world and uses it as a reference point while understanding what human security means to an individual, a community or a household, for that matter. This is the most applicable part of the study that has been utilised in the analysis. This research also rests on the presumption that energy security is something that cannot take place in isolation. It is a concept that must take into consideration the contextual position of every household of a region, community, society, and understand the energy poverty situation of the same from that vortex. Without it, the understanding of energy security emerges a rather shallow.

Conclusion- the Coinciding of Energy Poverty and Energy Security Coincide?

Significant proportions of household incomes in developing countries are dependent on energy expenses resulting from poverty and energy deprivation. A considerable amount of expenses in a poor household is directly expended on energy fuels, sometimes 20 - 40% on indirect costs associated with an assemblage and usage of energy such as healthcare costs, injuries or loss of time (Sovacool 2013). In most cases, it is seen that poor households in developing countries like India and Brazil, spend the majority of their expenses in obtaining basic cooking fuel, hence affecting the quality of life as well as access to energy, which has a direct impact on the household health of the population in question. It has also been observed that energy poverty has a direct impact on both genders and educational opportunities in developing countries, where access to energy is limited and conditional. The arduous effort of the collection of fuel fire depending on the availability of energy,

household size, travelling distance and seasons adds on the economic burden of a developing country.

These are factors that have an immense impact on not only the concept of energy poverty but have a lasting effect on the conceptualisation of the concept of energy security. Energy security has an indelible linkage with the concept of energy poverty, thus. Without the multidimensional approach to understanding energy poverty, the conceptualisation of energy security is not possible, at least, in the current times. In the context of the developing countries of the world, energy poverty has emerged as a national challenge. As has been explained earlier, these have taken the long route to change the direction that their economy took towards development. By the time these countries embarked on the journey to achieve development, especially after liberation from the colonial rules, which most of them have as a common factor, the international security paradigm had already taken a shift towards a more military approach, especially with the context of the cold war. However, most of the societies of these developing countries, in question, are not really coherent. There are several inherent divisions prevalent in these societies. These patterns determine the access of an individual and their household to the basic amenities of the country. That has a determining effect on the capabilities of the household.

Energy as well does not have a different trajectory. To begin with, the reliance on the industrialisation of these economies of the developing nations had prioritized the reception energy in a particular section for the longest time. With the advent of the new millennium and the increase in the global focus on global warming and environmental conditions, in general, has given rise to a separate dimension to the study of security. Energy security has to derive from the same. While the Copenhagen school provides the basic premise for the analysis, it is the energy poverty dimension that must be included in order to make the study of energy security more multi dimensional and relevant to the times. Gone are the days when just extending access to energy would suffice the eradication of energy poverty. Energy poverty eradication and the securing

of energy in particular involves the complex interaction between several other factors like the terrain of the region concerned, the gross income of a household in a particular region concerned, and the weather situation of the region as well. A comprehensive energy security would mean the establishment of all the above and more.

The key strategies for improvement in the conceptualising of energy security concentrate on the availability of energy fuels, with the source, suppliers, and spatial diversification as significant components. However, the emergence and interdependence of affordability, efficiency and environmental stewardship are important energy security dimensions to the understanding of the energy security in totality. Identification of trade-offs in the whole process of securitization of energy resources in the context of developing countries has a significant impact on energy security, as countries often choose to erode a national approach by progressing with another, at hand. Devoid of such observations, little attention has been generated so far to compare the relative strengths and weaknesses of varied national approaches to energy security, in comparison to the progress or regression of the same.

Chapter 6

Conclusion

The concept of Energy Poverty has evolved from being from evaluating it as fuel poverty in the context of the global rise of the price of a particular type of energy and the unaffordability of this energy by the section of the population of the world from the idea of access of energy services to each and every one in the society, irrespective of their economic status. There has been a major shift in the concept of viewing energy poverty comes with the change in tying the concept with economic considerations of individuals itself. Before even this, there is a need to decouple energy only as an input in the system of development of the economy, whereby it is but a cog in the machine to evaluate macro economic considerations of a country contributing to industralisation and development. From there on, energy has come to be conceptualised as a matter that has tremendous bearing on the well being of individuals of a society.

This evolution in the concept of energy poverty has come in the wake of the millenia with the increase in the global concern with degradation of the environment. There has been raised concerns regarding the increased dependence on fossil fuels, especially by the developed economies (big economies which are heavily dependent on fossil fuels). The impetus of academia has been to recognise the fact that energy poverty affects the lives of individuals not only when people do not have absolute access to energy or have access to poor quality of energy, but also are also unable to make the choice of a sustainable source of energy for individual or household consumption. It has come to be recognised that the effects of environmental degradation would, in the near future, not only affect the individuals and their households of the world, but also disproportionately affect individuals residing in some countries more than others. For example, the negative effect of the

rising sea levels of the world will be (to a large extent today is) been felt by smaller countries with dense population located in the tropical regions of the world, like Bangladesh, and the Maldives. The push to understand energy poverty, thus, in this case comes with a caveat that it is something that affects some section of the society more than others. While the debate of energy poverty at this juncture does take it back to the precondition of its inception that it is the income poor who get affected by it more than the non-income poor, the context of the debate, considering the nuances of energy poverty, shifts rather vehemently. While in the first precondition it is taken for granted that it is the poor who find it difficult to access energy for individual and household sustenance, in the later assumes that it is the choice of energy that immediately affects the environment around them. It must be noted that while the first presumption views energy as an input factor in the lives of individuals, the latter presumption looks at energy as an output factor having a resultant affecting the lives of individuals. Thus the context of viewing energy poverty has changed over the two dacades of the millenia.

This study has laid down, in detail, through the context of developing countries of India and Brazil how the concept of energy poverty has evolved over the years. Chapter one of the research brings in the contemporary debates regarding the evolution of the concept of energy poverty over the years and tries to negotiate the nuances that this study will be embarking on. In the same time, this chapter also lays down the primary methodological basis of the study. The fact that the research has been conducted keeping in mind the capabilities framework of study, presupposing it to be the most relevant multidimensional approach to understanding the concept has also been laid down in the chapter. Right at the outset of the research, it has been found out that the width of the concept of energy poverty is something that is growing with the passage of time and the growth in academia. The limits that the study will include in this study, especially with reference to capping the investigation to the inquiry of the electricity sector of the countries in question has also been laid out in the chapter. Further, what has been the basis of

choosing India and Brazil and what has been the parameters of comparing the two countries in their quest to annihilate energy poverty in their countries have also been laid down in this chapter. It has been perceived that viewing energy poverty from the lens of the electricity sector of the two countries would give a comprehensive idea into the concept, given that access to electricity can be apprehended as the basis of human development at the individual level in society. This does not overlook the fact that energy inputs and contribution to the well-being of individuals are also affected by energy in other sectors of country like cooking and transportation. The study rather comprehends electricity as a basic point of reference for the wellbeing of the individual because of its all pervasive nature in an individual's life. Also, in the same token, right in the beginning of this chapter it has been emphasized the necessity to cap the study of energy poverty to the electricity sector owing to the length of the study and paucity of time. It has been recognised that the character of energy poverty as has been investigated via the electricity sector can be taken as apoint of reference for similar studies in other energy intensive sectors of the countries in question. Thus, this study can form the basis of understanding the nuances of energy poverty in a holistic manner, including other sectors of study in the near future.

Beyond laying down the structure of this thesis with respect to its theoretical framework, the cases of reference, and the methodology of the study, the first chapter also, in clear terms provides the direction to the study with respect to the main research questions that the research will be addressing and how these questions are to be resolved in the following chapters. Also, the two main hypotheses of the research that guides the study has also been laid down in this chapter. In the following two chapters, the main discussion on the thesis takes place, whereby the nuances of energy poverty with respect to the two case countries are carried out. The literature review conducted in the first chapter provides context to the study in the following chapters. It is from where the literatures leave off that the study of energy poverty as understood in the context of India and Brazil begins in these two chapters.

The second chapter exclusively deals with the energy poverty scenario of India. It is found that what is understood by energy poverty in developed countries is essentially different from what is understood by energy poverty in the context of developing countries.While energy poverty has come to be understood in absolute terms in the context of the developed countries, the character of energy poverty is rather absolute in the context of developing countries like India. This means that the point of reference of energy poverty is quite different in the developing countries where energy poverty is looked at with respect to the lack of fuel to achieve higher comforts in an individual's life. On the other hand, in the developing countries, energy poverty means the lack of even the basic access to electricity to begin with. A large section of the India has been found to lack access to electricity. The study finds that this lack of access is, again, not homogenous in character. While traditional understanding of energy poverty presupposes that fuel poverty is something that stems from the lack of individuals and households to afford electricity, the study conducted and explained in chapter two of the thesis lays down how these kinds of presuppositions might be misleading in various contexts. For example the understanding that energy poverty is rather fuel poverty that is reflected in the poor households also assumes that the while in case of countries like India the majority of the income poor reside in the rural areas of the country, energy poverty must also be characteristic of the same rural households of the country. This however is not the correct way to understand the problem. This is because it has been laid down in the chapter how the rural areas of the country do not only reflect energy poverty, but energy poverty has been found to resonate in the urban households as well.

While the government data stipulates that a large number of rural areas (read villages) have been connected to the main electricity grid of the country, this chapter finds that the quality of electricity in these areas do not characterise continual and unrestricted supply of electricity. Further, connecting only a village to the electricity grid does not necessarily mean that every household of a village has been connected to the electricity grid. It might, in several cases

been found out that the electricity grid has come to be extended to select household of the rural society (read those households that either have a social or political clout or position) or restricted to government buildings like schools and post offices. Even there it has been found out that the connectivity to the electricity grid does not ensure uninterrupted supply of electricity even to these sections of the rural areas of the country.

Further, the question of choice of energy is something that has found to contribute to energy poverty in India, as explained in this chapter. There are still a large section of the lower income or income poor households in the country that rely on immediate availability of no cost alternatives to sustainable energy options because they happen to be readily available to the households. There is the understanding that these households, as the cost of a great deal of physical labour, choose to opt for, say, wood chips collected from neighbourhood, for fulfilling their energy aspirations. Firstly, they do not equate the contribution of physical labour as something that has immediate cost. Secondly, the relative cheapness (rather inexpensiveness) of the fuel that is immediately available to them also is not equated with the cost one has to pay at the level of environmental degradation that the choice entails. The consumer, thus, in these cases look at energy openly as an immediate source of input. They do not look at the necessity of converting the either the physical labour or the choice of unsustainable energy source as anything that would immediately affect the purses of the household.

In the same token, it has been found in the chapter that energy poverty becomes a multidimensional force that cannot be thus equated correctly with the income of a household. Even while income considerations and the share a household has to pay to access energy becomes important in determining energy poverty, the idea is not all pervasive in case of India. It is here that the character of energy changes from being an input to an output, whereby the necessity is to look at how lives of individuals are affected keeping in mind the choice of fuels in the country. As has been demonstrated in the chapter, the environmental cost of the choice of a fuel is rather ignored in the study of

energy poverty while equating it with only the income of a household. It must also be kept in mind that with respect to India, a large amount of household electricity is supplied from the exploitation of fossil fuels, even while there is the availability of renewable sources of electricity in the country. This is another core factor that adds to the character of energy poverty in India. It has been found that even while there is a relative availability of renewable energy resources in India, there are some real hurdles towards the path to exploit them in order to achieve universal electricity for all in the context of India. These factors have regional character.

To begin with, it has been noted in chapter two that the supervising factor that beyond an urban and rural divide in the character of energy poverty in India, there is a tangible regional aspect to the problem. While there is a need to understand that all the regions of the country, as reflected by the states they represent, do not have homogeneous standards of development in the country, this development is echoed also in terms of the availability of energy resources in these regions. The regions or states that have higher index of development, those that contribute more toward the generation of GDP for the country are also the regions that have been faring better in access to electricity for the section of population residing in these regions. Similarly, the regions that have ready availability of fossil fuels have better chances of having access to electricity. This is because the electricity sector in India still, as has been explained earlier, heavily dependent on the exploitation of fossil fuels. This however does not mean that the regions that have ready availability of renewable fuel sources have seen increased reliance on its exploitation. This is another conundrum that energy poverty faces in the country. Beyond these regional characteristics of energy poverty, the chapter also explains how the increase in the price of electricity has also contributed to the unaffordability of electricity for consumers in the country. Thus, the characters of energy poverty in India has come to be viewed rather in an absolute perspective, whereby all the main tenets of energy poverty, namely non-access, unaffordability as well as reliance on unsustainable energy sources, find

reflection. The chapter, thus, addresses the first section of the second question that has been raised as the basis of this study.

Chapter three of the thesis does a corresponding study of the energy poverty situation of Brazil. To summarize, this chapter lays out that the nuances and characteristic s of energy poverty as can experienced from the case of Brazil. Brazil as a country has achieved some envious feat when it comes to access to energy. It has been found by the study that Brazil, as a country has achieved almost 100 percent access of electricity for the people of the country. On the other hand, the study in this chapter also finds that e country has been able to direct the generation of electricity largely from renewable sources. The majority of electricity in the country is generated from hydro power installations. In the current times when the reliance on fossil fuels is something that has come to be frowned upon, this feat of a country, a developing one that too, to base a major part of its electricity generation on renewable source is something that is rather an example. However, to claim that the country has been able to achieve complete eradication of energy poverty is rather far fetched. It is interesting to note that the points of reference that makes this country's story of making electricity access universal for all, is the point of reference from where energy poverty emerges.

Firstly, it must be noted that even while the generation of major part of electricity from the hydropower sources is an issue that must be commended as an achievement for any developing country and must be investigated further for the possibility of replication in other developing countries as well, an absolute reliance on hydropower comes with its own problems that country has come to embody a case study of. Heavy reliance on electricity generation from hydropower installations come with two fold fallacy. Firstly, hydropower generation relies on the maintenance of continual flow of water at least at a particular pace in upper riparian sections of rivers. Brazil is a country that boasts of a robust system of upper riparian river systems that has contributed to the exploitation of electricity. In regions where the availability of such river systems lie in the border areas with neighbouring countries, Brazil has also

come to enter into successful energy and water sharing treaties with its neighbours to reap the benefits of electricity generation. However, such a heavy reliance on hydropower has made the country susceptible to loss of access to electricity in seasons when there is less rainfall. Brazil has experienced the loss of electricity in the months when there is less rainfall. The evolution of hydropower in Brazil is spotted with years when the country has experienced extreme droughts. In those years, as well as in seasons every year when the rainfall is below expected levels, the country has experienced diversification of electricity generation on unsustainable sources of fossil fuels. This brings the problem of energy poverty back to square one whereby even catering to electricity generation from renewable sources does not resolve the problem, due to the seasonal character of the resources.

Secondly, the transportation of electricity from one region of the country to another, keeping in mind the large dimensions of the country has contributed to the increase in the price of electricity. In the same token, it must be noted that the study in this chapter has found that the next referral point of the energy poverty in the country has been the extremely high tariff rates of electricity in Brazil. There are several factors that contribute to this phenomenon. Other than the above point where the transmission cost of electricity contributes to the increase in price, there is the problem of reliance on thermal power plants to generate electricity during the dry seasons that contribute to increase in tariff rates above the regular rates. In years or seasons when the hydropower plants cannot be relied upon, the thermal power plants have to supply electricity at a raised rate that comes as a surprise to the consumer. Thus, this extra payment of cost of electricity is something that appears to the customers beyond the budget they must have created to spend on electricity access.

Further, in places of Brazil, there is a system of reliance on meters that flag customers that use electricity beyond a stipulated limit and in those cases there is a penalty that is levied on the family. The analysis is this case shows how the burden of energy poverty falls on the consumers at the rate of extra tariff

rates as well as penalty in case spending electricity beyond the rationed amount. It must be noted that while households are made the basis of analysis in the study of energy poverty, there are several ways in which a household is understood. There is no homogenized standard of a household.In developing countries households come in different shapes and sizes. There are households that might consist of three to four constituents while there might be households with twelve or more individuals in it. Similarly, the source of income of these households differ in many levels. There might be multiple sources of income in a large household. However, in many cases it has been found out that a large household might consist of only a single source of income. On the other hand, what are the sources of this income of the household also varies in a developing country where a large section of the population are involved in disorganized sector. Based on this, it can be comfortably stated that the sources of income of these households might very well be seasonal in character and abrupt. Also, every month a household income does not see consistence. In this context, the seasonal character of electricity access, the unpredictable and abrupt rise in tariff rates as well as the reliance of the burden of energy conservation on the consumer groups of the population is a factor the definitively contributes to the energy poverty scenario of the country.

Lastly, the large scale privatization of electricity production also contributes to the rise in electricity tariff rates in Brazil. The country has seen a similar trajectory in privatization of the energy sector as has seen India. It has been observed both in the case of India and Brazil that the energy sector has been privatized after the 1990s along with the global trajectory of developing countries around the world. As a reason of this, even while a large section of electricity generation is controlled by government agencies, the tender for the production and distribution of electricity is given to private companies in Brazil. The profit motive of these companies have contributed to the rise in electricity prices to such an extent that Brazil today boasts of an electricity rate that is one of the highest among the world, even higher than developed

countries like the United States or Japan, for that matter. This is something that contributes to energy poverty given the fact that the price of electricity generation is, on the contrary, very low in Brazil. Thus. energy poverty in Brazil arises from two tenets of the concept, namely the lack of affordability of energy as well as the seasonal reliance on unsustainable sources of energy.

The fourth chapter highlights the energy policies of India and Brazil and analyses its effects on eradicating energy poverty in the two countries. It has been found that even while the performance of a large section of the electricity sector in both the countries is controlled and regulated by government and state entities, energy poverty prevails in these countries for a limited understanding of energy security in these countries. While there is a growing understanding of environmental concerns in these two countries, both of them have not been successful in attaining energy for all from non-renewable sources for the sake of maintaining sustenance. It must be made note of the fact that a layered study of energy poverty in developing countries do reveal that the burden of attaining development through the reduced exploitation of fossil fuels do fall unfairly on developing countries. That is something that has an impact on energy poverty of these countries.

The second last and the fifth chapter of the thesis throws light on nuances of energy poverty as has emerged from the case study of India and Brazil. The need for the evaluation of energy poverty for a better understanding of energy security of a country has been enumerated in this chapter.

Finally, through the analysis of the cases of India and Brazil, and a thorough study of the energy practices in these two countries, the thesis has found its primary hypotheses of - *(1)Addressing energy poverty is of significant importance for an economy in meeting its national energy security goals; and (2)Energy poverty consideration have not been adequately reflected in the formulation of energy policies by the governments of India and Brazil*- to be valid. It has been highlighted through the study how and why recognising energy poverty parameters of a country is of essential character in order to

fully gauge the dimensions of the energy security debate. Both India and Brazil, while standing on different economic footings, project separate homegrown factors contributing to energy poverty with contextual characters. The second hypothesis has been found to be true in the context that even while general tenets of energy security, as it has developed over the years in international discussions, has been catered to by the two countries, in terms of committing to adhere to international standards of environmental conservation, efficient use of energy, etc, both the countries have a long way ahead of them to completely integrate the individual based energy poverty goals in their interpretation of energy security. When energy security today must incorporate energy poverty because of its implications on the daily lives of individuals and their choice of energy in their daily practices, these nuances have not been discussed in detail by either India or brazil. While India still has a long way to go in order to achieve universal and affordable electricity for all alongside commitment to exploit sustainable sources of electricity generation, Brazil has been found to lack in the provision of affordability of electricity to the consumers and majorly lacking in maintaining the sustainability quotient of its hydropower base due to massive bouts of dry seasons and subsequent reliance on thermal power.

To conclude, one can expect that this research be treated as a step to further the academic inquiry into the study of energy poverty in developing countries. Energy has become an issue of not only academic but also socio-political debate. It is necessary that we understand that the social context of energy security is not left aside while discussing its trends and developments. Understanding energy poverty thus becomes essential to the argument that energy security becomes viable only when there individual aspirations to energy security attains significance. It is expected that this research will acquire an important step in that direction.

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