Green Electricity Consumption In India - An Empirical Investigation Of Consumer's Choice In A Deregulated Indian Electricity Market

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ABSTRACT

Given the many socio-economic benefits of Renewable Energy Sources (RES), there is an urgent need to increase its penetration in the final energy mix for many countries. However, despite India's push to increase RES penetration, the actual share of green energy portfolio across sectors remains exceptionally low. Consumer's WTP (Willingness-To-Pay) for RES becomes an important variable of consideration since it often reflects the social acceptability of green technologies. To investigate this in the Indian context, this study investigates residential consumer's WTP for RES projects using the "Contingent Valuation Method", along with factors influencing the same. The analysis was conducted using the contingent valuation method across 120 residential responses from a southernmost state of India called Tamil Nadu. Findings reveal that WTP for RES is existent, but low owing to lack of awareness of benefits of RES and the belief that electricity bills are already high. The paper concludes by presenting recommendations to enhance the adoption of RES amongst residential consumers in India

Keywords
Green electricity, WTP (Willingness-To-Pay), Renewable Energy Sources, Contingent Valuation

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Introduction

In recent decades, non-renewable energy sources including coal, flammable gases, petroleum, and other oils have been a fundamental requirement in many sectors of the current economies. Fossil fuels are an important source of power generation, which is indispensable in all sectors of life including the residential, organization, business, industrial, transportation, and administrations. As per the information by the International Energy Agency (IEA), the worldwide total energy supply has increased by 150% between 1970 and 2013 (IEA 2015) [1]. Moreover, as the economies in most developing nations keep on encountering financial development and relatively fast economic growth, the demand for energy generation is probably going to increase broadly because of the shift towards energy- intensive activities. which leads to an increase in the emission CO2 and other greenhouse gases into the atmosphere. Therefore, there is a desperate need to generate a renewablesource of electricity which is also called green electricity. Green electricity is the need of the time that we live in and helps in sustainable development as it reduces the air pollutant exponentially and at the same time reduces the dependency on traditional fuels like coal and petroleum (Guoa, et al., 2014) [2]. As it says with benefits comes some negatives too. For the first, Uncertainty is always there in the generation of electricity and the second major negative point is that these green projects need high initial financial support, as the technology involved in these are expensive (Simona Bigerna& Paolo Polinorin, 2014)[3].Non-renewable sources include Solar power as the major source. Then second is Wind, another most explored sources. Rest includes small-scaled hydro plant, tidal & bio- mass plants (Guoa, et al., 2014) [2]. Therefore, the Indian government has initiated green electricity and other renewable or sustainable power projects. To support their development and promoting them, government has brought many amendments into the policies and introduced many schemes. For example, several solar project schemes like Jawaharlal Nehru National Solar Mission (JNNSM), Government Yojana, UDAY Scheme, etc in India areestablished to develop renewable energy or green electricity. However, several barriers to the development of green electricity still exist in India and amongst all prices, a barrier is considered as the main obstacle. The power generation using wind energy is approximated to be 1.5 to 2 times expensive to that of coal-based plants, whereas solar power energy costs even more which is to be 3 to 6 times of it (Zhao. J & Huang. Q.Y., 2009) [4]. The subsidies provided by the government do reduce the cost but the irregularity in payments of these subsidies to the producers creates a burden on the producers. Thus, to promote these green electricity projects, the Indian government should take prominent decisions and policies to compensate the producers and consider asking customers about their preference and WTP for Green electricity. However before formulating any policies, several questions like "Are consumers willing to pay a surcharge to support Green electricity? What amount would be affordable for consumers? What are the factors that affect the WTP for green electricity?" etc should be answered on a survey basis in-order to develop a policy for green electricity generation and consumption. Every individual reacts differently and shows their concerns for the environmental changes happening across the globe and they should react has some way or the other, their lives are getting affected too. Everyone should or do their part in reducing the emission rate of CO2 or reducing other agents of pollution. Being among one of the most highly CO2 emitting as well as populated country in the world, it is most significant that residents or citizens help to bring down emission at an individual level (Barry D. Solomon & Nicholas H. Johnson, 2009) [12]. According to XiuruiGuoa and Haifeng Liua

(Guoa, et al., 2014) the primary factors or parameters affecting or impacting the WTP of the consumers include electricity consumption, income, bid, and payment vehicle [2].

Renewable energy adaption is necessary as it decreases carbon emissions into the atmosphere and further reduces the dependency on non-renewable resources for electricity generations, regardless of its intermittent supply and its high generating costs. The cost of the technology has gone down during the past decade and new methodology is being developed to lower the costing and prices have been dropped down significantly.

Green projects have increased and have proven their mettle on the environmental front also. The automobile industry also plays a vital role in the sustainable battle as automobile vehicles are another major contributing source to these harmful emissions. New policies should be developed and old ones should be amended for better results. Consumers' or users' acceptance is crucial. It also needs encouragement for financial support and establishing the sustainability of these green projects.

In the past, energy-related projects not only renewable but non-renewable or coal-based also, not much participation from private sectors have been seen. One of the reasons is too many rules and regulation, then government officials make it difficult to pass for their benefits, direct or indirect. On another hand, consumer's WTP is unknown for green electricity. India has a lack of data on these particular studies where consumers behavior towards WTP for electricity or green electricity. In the initial stage of any plant, it is important to understand the financial and economical returns and for that literature or new study should be done.

Hence this study aims to analyze and study consumers' behavior for WTP and affordability for green electricity.

Many studies have been conducted and literature has been made to determine the consumer's WTP for renewable or clean energy in several countries across the globe using Contingent Valuation Methodology (CVM). This study attempts to predict the WTP (Willingness-To-Pay) of Indian consumers for renewable or green electricity and also to list the factors that affects or impacts the decision for WTP for green electricity. By using the CVM in the southern region of India focused on Tamil Nadu and Kerala, regions which have greater exposer to the sunlight, coastal wind, and other natural resources, which should be economically be considered for the generation of green electricity.

Literature review:

Since the residential area is a considerable energy customer in almost all countries in the world, numerous ongoing investigations have concentrated on the relationship between carbon emission and energy consumption in the residential sector. As portrayed by (Azlina, Mahirah, & sin, 2018), studies concentrate on household energy utilization falls inside the disciplinary and integrated sectors [1]. The survey is conducted in the southern region of India for not only the greater availability of renewable resources but also it would be more interesting to investigate the residents living in those regions. Wind power limit in Tamil Nadu expanded from 877 MW to 7,652 MW between the years 2002 to 2017. The major issue of the local industries of the state is the lack of continuous electricity supply by the Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO). Tamil Nadu state government has offered several policies and incentives regarding wind power generation which in turn driven the local power generating industries to invest into wind electricity generation (staff, 2019) [15].

Tamil Nadu holds ninth position in the net share of wind energy globally. Almost 14.3% of all the vitality request of the state is fulfilled by sustainable power source, fundamentally sun and wind energy. Moreover, the state is well known for the cost effective production of quality wind mill towers and blades all over the world. Tamil Nadu remains the pioneer in renewable energy or green energy among all the other states in India with the installed renewable energy capacity of 11,113KW. Within the year of 2017-18, the State has tackled around 13,000 million units of Wind Energy. Kanyakumari the southern-most tip of Tamil Nadu has the highest wind power capacity of 1500MW in India. Tamil Nadu has a total Solar Installed Capacity of 2,034 MW and between the year 2017-18, the State has installed almost 2,905 million units of Solar Energy. Due to ultimate involvement in the field of Renewables as mentioned above the state reduced almost 5,406 million tons of carbon emission by reducing electricity generation using non renewables like coal (JeslinDrusilaNesamalar, P.Venkatesh, &S.Charles Raja, 2017) [21]. During southwest and northeast monsoon months the generation of wind is maximum and produces high wind electricity which decreases gradually for the rest of the months. To balance this electricity generation, the state introduced storage capacity which permits storing excess electricity generated during the monsoon months in exchange for the low power generating period. There is maximum power generation, in exchange for the low power generation periods. As per TASMA, TANGEDCO encourages these banking of energy since the costs of power purchase are high during the minimum power generation time (staff, 2019)[15]. The state has various renewable energy sources like Wind, Solar, Biomass, Biogas, Small Hydro, etc. Industrial wastes from several manufacturing industries in the state could also be useful sources of energy for biogas resource if the disposal of wastes were safety ensured. And hence it remains No. 1 in India has a developed or in working state installed capacity of 4287 MW as till 2008, which is about 44% of the constructed capacity in India. The power generation has surpassed forty billion units (aggregate) as per TEDA –Tamil Nadu Energy DevelopmentAgency.

The examination for WTP (Willingness-To-Pay) for development of green electricity in several literary works reveals that the most widely used method is the Contingency Valuation Method (CVM). There have been several studies made to predict the WTP (Willingness-To-Pay) for the development green energy as well as studies about introducing policies regarding WTP (Willingness-To-Pay) for implementing green electricity were made in several countries. Ju-Hee Kim used Dichotomous Choice questions in the Contingent Valuation Method in his research of WTP for smartphones and the involvement of IOT usingrenewable energy "(Ju-Hee Kim, Hyo-Jin Kim, &

Seung-HoonYoo, 2019) "[5]. (Joseph E. Aldy, Matthew J. Kotchen, & Anthony A. Leiserowitz, 2012) also analyzed average US citizens are willing to pay 13% more than acquired electricity charges, in support of NCES (National Clean Energy Standard) that requires 80% clean energy by 2035 using contingent valuation method [11]. (Guoa, et al., 2014) Xiurui Guo also stated that generating policies for green electricity funding needs a feasible method to acquire cash for supporting the production of green energy but those policies should guarantee that collected funds are utilized in an efficient way for the production of electricity from renewable energy plant [2].

This study aims to understand the willingness or readiness of consumers. The literature review is to get an overview of the main objective and methods used in recent research about WTP (Willingness-To-Pay) for the renewable or green electricity and other renewable energy or commodity. It includes counties, period, Methodology, Research focus, and findings. And are tabulated as follows

Authors	Country	Sources and year	ResearchFocus	Method	Main results
Xiurui Guo; Haifeng Liu; Xianqiang Mao	Beijing, China	ELSEVIER 24th Feb 2014 [2]	1	cv	46 % which is almost half the sample population are not ready to pay more for clean & green electricity. The remaining sample survey population shows readiness only when others pay more too.
Barry d.Solomon; Nicholas H.Johnson	United States	ELSEVIER 9th Mar 2009 [12]	2	cv	In the CVM scenario than in the FS scenario (83.8% vs. 76.2%) participants are ready to pay extra for other products like bio diesel / ethanol.
Leila Daghera, Hassan Harajli	Lebanon	ELSEVIER 18thMay 2015 [8]	1	cv	This paper's WTP is estimated higher in case it leads to displacing diesel sets in exchange of green electricity.
Joseph E.Aldy; Matthew j.Kotchen; and Anthony A.Leiserowitz	United States	LETTERS 13th May 2012 [11]	1	cv	This literature work focuses on citizens' opinions and political supports which is consistent in favor of clean & green energy. Changes in policies for climate change and the cost reduction schemes may find political support.

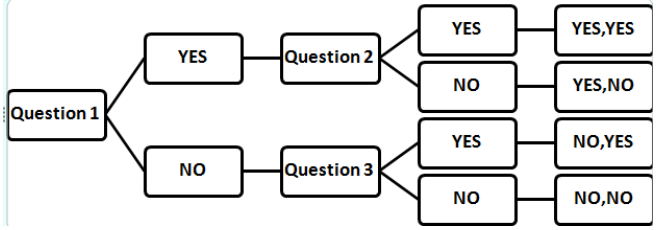
*Note: 1 –WTPfor renewable or green electricity.
2 –WTPfor Commodities like Smartphones and biomass ethanol. CV – Contingent Valuation.

Methodology:

3.1Method: contingency valuation (CV) approach

As mentioned already the majority of WTP researches used the Contingent Valuation Methodology. Contingent Valuation is a method of predicting the amount that an individual accepts to give on a product. This approach questions people to directly represent their acceptability or WTP to acquire a specified product, rather than deducing the price from previous observations in regular markets. Contingency valuation is generally carried out by diverse choice questions. The most widely used dichotomous choice (DC) question methods are,
single bounded dichotomous choice(SBDC),
double-layered polarity choice (DBDC)and
one and one & half (1½) bounded dichotomouschoice(OOHB-DC).

The Single-Bounded dichotomous or polar choice or option is a questionnaire, in which the respondents are offered a specific amount or price-range and asked if they are willing or accept to pay for it. Similarly, in one and one half bounded dichotomous or opposing choice (OOHB-DC) question method, respondents are asked are they are willing or accept to pay the lower price bid amount at first? If the respondent agrees then a question of WTP (Willingness-To-Pay) for higher bid amount is asked at the same time if the respondent disagrees then no further question is asked to the respondent. Where in, Double Bounded Dichotomous choice (DBDC) method is further effective than Single Bounded Dichotomous choice (SBDC). For Double-Bounded Dichotomous choice of Contingency Valuation Method (CVM), respondents are asked if they are willing or ready to accept and pay or not at the present price which is average bid amount. If a respondent agrees to pay the price, the higher price (higher bid amount) is displayed next. If a respondent disagrees or rejected to pay the price, the lower price (lower bid amount) isdisplayed.This type of questionnaire which represents the Double Bounded Dichotomous choice type (DBDC) is what utilized for this study.



This method generates four sets of responses they are – (yes, yes), (no, yes), (yes, no), and (no, no) as mentioned above in the figure. Thus, it is a furthermore efficient method than the Single-Bounded and 1½ Bounded DC (dichotomous choice) method.

And now consider t1 be the first bid amount and t2 be the second, the following upper and lower bounds are the results of four sets of responses of the participants' WTP (Willingness- To-Pay or acceptability).

$WTP >$ t2, is the [yes –yes]response
$t1 \leq WTP <$ t2, for the [yes –no]response
$t1 > WTP \geq$ t2, for the [no-yes]response
$WTP <$ t2, for the [no–no]response

using the following general form of WTP described by "Haab and McConnell" (2002)

$WTPij = \mu i + \varepsilon ij$

Where,
$WTPij$ is jthrespondent's unobserved true WTP (Willingness-To-Pay) and i=1,2 are responses to initial and the successive bids respectively according to the preferences of respondents.
μ1 = the mean of the first response
μ2 = the mean of the second response and
εij= the error terms of the true WTP (Willingness-To-Pay) of the respondent.

3.2 Survey design:

The survey questionnaire of this study was highly transparent and specifically mentioned what the respondents were asked to contribute and what they will benefit from the contribution to the production of green electricity. The survey questionnaire was designed vigilantly to avail accurate and sufficient data for the respondents.

The survey questionnaire consisted of seven sections in total where the first section contained the basic questions about the respondent's details like name, age, residential city, occupation, etc. The second section consisted questionnaire

which tested the environmental consciousness and altruism of the respondent. Then the third section of the survey explained briefly about green electricity and its necessity along with the policies regarding renewable energy that other countries implemented to reduce their carbon emission. It also clearly mentioned a few examples of surcharge or cess added as additional pay in monthly electricity bills by other countries. From section four to section six Double-Bounded-Dichotomous- Choice questions are asked as mentioned above. Fourth section contained questions regarding WTP (Willingness-To-Pay or acceptability) for green electricity at the average bid amount per month. If the respondent accepts then the survey directs the respondent to section five which has a question of WTP for green electricity with an upper bid amount. If the respondent rejects, the survey directs him to the sixth section containing a question or survey for WTP (willingness or readiness to pay) for green electricity with a lower bid amount by skipping section five. The last section contained few direct questions to analyze the public view regarding the surcharge added to electricity bills and to predict the factors that impact or responsible for the WTP (willingness or readiness to pay) for Green electricity.

3.3 Sampling:

Sample respondents for the survey were selected from the residents of the southern region of India especially Tamil Nadu. South India generates or produces around ½ or 50% of the country's renewable or clean energy and Telangana has more than 10 Gigawatt demand. Wind and solar power plants installed capacity have been multiplied 2 times or doubled over the past few years. The installed wind and solar plants are approximately fifty percent of India as a whole. Therefore, it is interesting to investigate or recognize the consumers or users in the region in support of the development of clean and renewable energy for green electricity increase in India. The number of participants or respondents was 120 and this survey is collected as one major individual from a household. The purpose of this study and generating was not only to investigate and recognize the WTP (Willingness-To-Pay) in support of green electricity in India but to predict the factors or parameters that affect or impact the WTP (Willingness-To-Pay) also in support of greenelectricity.

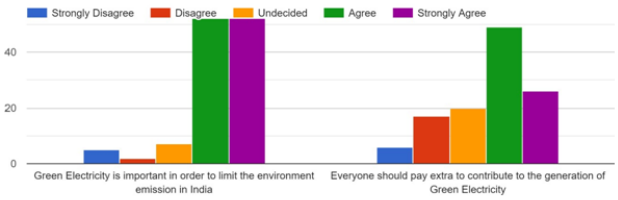
3.4 WTP (Willingness-To-Pay) Question:

The respondents were asked to assume a scenario which says, suppose the Indian government has been planning to implement green electricity policies and its reforms by adding a surcharge to the actual electricity bill per month to consumers who can afford or willing to afford to pay for green electricity. This is because the generation of green electricity is quite expensive and more eco-friendly than generating non-renewable energy. WTP (Willingness-To-Pay) for green electricity by consumers would reduce the carbon emission rate in India. If such a program is implemented in India, will you be ready to pay apremium or extra charge for renewable electricity, over and above what their current monthly bill going to be?

They were also asked to assume that this premium is levied for the higher cost of renewable electricity production and that this premium will be a permanent feature in your bills. According to the Double-Bounded-Dichotomous-Choice question method, the considered lower bid amount, average bid amount, and the higher bid amount is RS.150, RS.300, and Rs.450 respectively.

4. Results and discussions:

As mentioned already the survey is collected from 120 respondents across southern India. The first few sections of the survey were fully concentrated on the investigation of the acceptance rate and WTP (Willingness -To-Pay) for the generation of green & clean electricity among the respondents. We started by testing the respondents with environmental consciousness and altruism questions so that the consumer's concern and responsibility for environmental issues like global warming, pollution, resource exploitation, etc. can be analyzed. According to survey results, 86% of respondent believes that human interference is a major participant or contributors to pollution and accepts that every citizen must take responsibility for environmental issues. They also believe that the effects of pollution on public health are worse than they realize. Almost 77.5% of consumers believe that relaying on green electricity will minimize carbon emission issues. When it comes to knowing the importance of green electricity and wanting it to be implemented almost majority of the respondents agreed but at the same time if they are instructed to pay extra for green electricity their acceptance rate reduces about 24% and almost 19% of the sample disagreed to the concept of paying extra for green electricitygeneration.



Note: The survey asked to indicate the level of engagement or agreement for the questions mentioned in the horizontal axis.

The questionnaire method utilized in this contingency valuation study was the DBDC method which has the survey questions comprising of a yes or no response to initial and follow-up questions which is also called the binary response. It is exactly in contrast to the (Single-Bounded) SBDC Method, a "Yes" or "No" choice of answer followed by upper bid and lower bid questions, increases the accuracy of WTP (Willingness or Readiness-To-Pay) and reduces the complexity of the survey. Otherwise, each individual or participant will respond to his preference which will create confusion. This DBDC (Double-Bounded- Dichotomous or Polar-Choice) is increasingly efficient than an SBDC (Single-Bounded- Dichotomous-Choice), this is because of the previous question about the price of willingness is like a assurance or backup against the poor decision of bid amounts. There are three different ways why Double-Bounded-Dichotomous or Polarity-Choice DBDC is more effective than the Single-Bounded questionnaire. To start

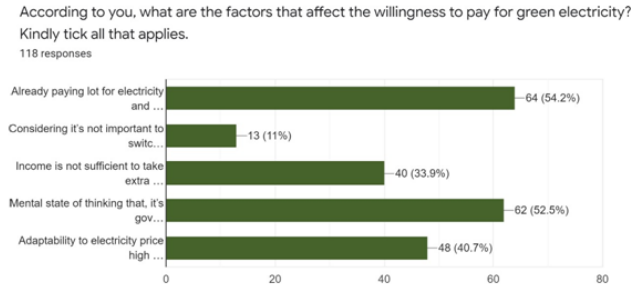
with, the choices like "yes–no" & "no–yes" gives a clear or less complex bound to WTP (Willingness-To-Pay), then the choiceslike "no-no" and "yes–yes" provides greater accuracy & efficiency, last but not least, the number of responses were significantly expanded, particularly for bigger example sizes.

From the survey results, nearly 69% which is more than ½ of the participants or respondents were willing or ready to pay for the first bid amount of Rs 300 although 34% of the sample felt this amount is quite expensive. It can be identified that almost ½ of the respondents are willing or ready for giving or pay a higher bid amount of Rs.450 from the results of the survey and only 3.3% of the consumers are not willing to contribute to the green and clean electricity. The total number of participants, who were willing to pay for the first-bid amount but not for the higher bid amount was approximately 18.3% among all respondents. And nearly 19% of consumers or participants are not willing or accepting to pay for the first bid amount but willing to pay for lower bid prize or amount of Rs.150. When this is analyzed, consumers who pay electricity bills less than Rs.500 and Rs.1000 are reluctant to pay surcharges since it makes a greater difference in their monthly electricity bills.

Maximum consumer favors for Renewable energy sources yet knows very little or no knowledge about it. Utility Market surveying study research shows that consumers' preference or priority for green electricity along with WTP (Willingness-To-Pay) for the surcharge added to their monthly electricity bill. Across the investigations analyzed, a maximum of 52% to 95% said they were willing to pay the surcharge of any amount per month for their electric bills for power from renewable power sources. Deliberative surveys showcase that residential consumers WTP increases when clients are educated or taught about utility and the importance of renewable energy for our sustainable growth. Overall investigations, consumer WTP (Willingness-To-Pay) follow an anticipated example. A normal of 87% expressed WTP (Willingness-To-Pay) at least of Rs.150 every month for power from renewables. The rates of WTP (Willingness-To-Pay) decrease as the surcharge per month increases. Approximately 67% of consumers state they are willing to pay anamount of Rs.300 per month extra, and 48% state they are willing to pay Rs.450 per month extra for power from renewable resources. It seemed, if utility market survey approaches the residential electricity users or consumers about WTP (Willingness-To-Pay) for renewables will show a similar pattern of results; however, might slightly vary according to the survey samples. Few limited amounts of information show that consumers are comparatively prone to pay extra or more for sustainable power sources in a serious market. The obtained survey result shows that consumers will show greater WTP (Willingness-To-Pay) if a policy saying mandatory contribution for green electricity introduced by the government.

Although investigation of this study are concentrated about the willingness of residential electricity consumers to pay for renewable electricity, there exist a constrained proof regarding industrial business consumers shows willingness to pay for the development of renewable energy. As per the findings of (Ju-Hee Kim, Hyo-Jin Kim, & Seung-HoonYoo, 2019) samsung electronics announced to take part in RE100 campaign in South Korea in order to support the concept of reducing carbon emissions by producing smartphones using renewable energy. Industrial consumers are much more willing to invest into RES (Renewable Energy Source) in order to survive in the market since their customers prefer products manufactured using renewable energy rather than non - renewables. Consumer perspectives are progressively positive toward utilities that incorporate renewables in their power generation mix. Although the entire survey of the paper concentrated solely on an utility of green-electricity and its' WTP (Willingness-To-Pay) for extra amount, we analyzed that there exists a potential WTP (Willingness-To-Pay) for further more than regular electricity charges in order to support and increase the generation of renewable energy.

This study was also intended to predict the factors affecting the WTP (Willingness- To-Pay) for the development of green electricity. As per the data collected, the results of the questionnaire are that nearly 64.4% of respondents pay an electricity bill of an amount lessthan 2000rs. Thus the rise of Rs.300 in their electricity bill would not be an easy task to consider. Other factors that affect the WTP (Willingness-To-Pay) are considering its government duty to provide subsidy for the generation of green electricity, lack of awareness regarding carbon emission, poor in adapting to the electricity price high, and income of the respondent.



Note: The survey asked to select all the factors that apply to the respondent personally

We have chosen gender, age, the electricity bill, education, and income, awareness, knowledge, and environmental concern as covariates to estimate the results along with these covariates. As per the result estimation, respondents with higher income tend to accept the higher bid amount without any resistance as the increased cost imposes a lesser burden. At long last, people who have more knowledge of sustainable power sources indicated more willingness to pay (WTP) than other respondents with lesser knowledge and information on the consequences of non-renewable energy. In other words, proper education and advancement will progressively prompt the acknowledgment of green energy.

Conclusion and recommendations:

The Carbon impression of a nation relies primarily upon its degree of advancement and the carbon emission of the economy. On per capita basis, India's carbon emission trail is one of the most minimal on the planet. However, being the primary coal-dependent for electricity generation, India is the third-biggest nation in terms of CO2 outflows on the planet, followed by just China and the United States

(International Energy Agency, 2015).As per a report by the Ministry of Environment, forest, and environmental change (2015), the majority part of India takes a huge share contributing up to 71% of the entire greenhouse gas emission of the nation. Continuous economic development and enormous population development, India's energy request will double and reach almost 1,900 million tons of oil proportional (Mtoe) by 2040, making India the biggest country with huge coal demand for the development (International Energy Agency, 2015). This implies that the development pattern of India will have a huge impact on the global environment. Thus, it is highly important to implement a renewable energy policy regarding the addition of a surcharge to the monthly electricitybill.

We evaluated the WTP for green electricity to examine the awareness and importance of green electricity, which is different from the current renewable energy policies in India.

Specifically, the acceptability of "Nuclear Power" plants, as well as coal-petroleum power plants, has diminished because of pollution and its consequences. Under such conditions, we analyzed consumers' WTP for green electricity in-order to upgrade from non-renewable energy sources to renewable. The evaluated WTP depends on the CV method, and we clarified the definitions, pros, and cons of renewable energy sources and green electricity along with few examples of implementation of renewable energy policies in other countries for comparison in surveys.

The outcomes show that Indian individuals have a WTP of Rs. 300 per month to change from "Nuclear Power" plants and "Coal-Terminated Power" plants to sustainable power sources called green energy. This clarifies from the possibility or probability that the consumer's or participants' requirement and understanding for the eco-friendly environment or danger or risk of exploiting the resources have been raised considerably in recent times, which leads to a high level of guilt or sadness and acceptability or adaptation of green energy. Furthermore, due to the high cost and increased pollution of coal-terminated power plants, it seems that consumers' preference over coal-based energy also changing towards green energy.

The discoveries of this study are expected to help in giving data for outlining and highlighting the policy inclination or orientation of natural renewable energy advancement in India. It is highly necessary to prioritize government investment or financial programs and organize them according to the planned expenses. This study would help in the segregation of investment projects within budget and with greater advantage rather than implementing projects with low planned expenses.

The decision making associated with developing clean natural renewable energy, which influences the environment, should mark economic importance when there are important questions regarding whether to encourage projects or schemes effectively to promote and spread green energy reducing the harm to environmental property and to save them. It showcases the choice or options among preservation or securing it and advancement is affected by public assessment and realization.

As the investigation on social or economic value for sustainable energy & renewable energy and its understanding among consumers empower us to understand that renewable energy is the basic and essential component in the choosing stage. The undeniable and irrefutable impression of the effect of renewable energyin the choice stage can encourage our ability to understand and evaluate the commitment to real nationalwelfare.

Since Indian consumers or participants showcase WTP (Willingness-To-Pay) for Green electricity, the government should fund-raise to compensate for the extra expense of generating electricity from renewable energy in comparison to traditional plants by putting some additional charge on electricity bills. A public-private partnership with the fund collection scheme can also be another way for generating financial support for the plants. A Green Electricity Fund is a feasible method to fetch cash for supporting electricity generation from renewable or green energy and private partnership will bring in the technological part. However, extensive policy amendments and measures for collecting and utilizing the fund to be guaranteed that the cash is necessary to generate electricity from green energy. Other methods for collecting funds like state government financial support and imposing an additional charge on extra or heavy consumption of electricity are important.

Since consumers' knowledge and response to air pollution, carbon emission, and other environmental issues significantly affect their WTP (Willingness-To-Pay), state governments should educate the consumers and general population about the impacts of air pollution and carbon emission and the importance of changing the source of electricity generation from non-renewable to renewable will increase consumers' support for green electricity. The government should spread awareness and strict punishments for rule-breaking in support of the improvement of green electricity through administered support like reinforcing the laws and policies regarding renewable and clean natural sources energy industries and financial management. These endeavors will make a good environment for the advancement of green electricity.

Limitations:

This study is about WTP (Willingness-To-Pay) in India for green electricity, but the survey and sampling are particularly concentrated toward the southern region of India. Being a greater producer of renewable energy in the world the results of the survey taken in this region might be more positive towards WTP (Willingness-To-Pay) for renewable energy when compared to other regions like the north and northeast of India where many residents have no access to the electricity itself.

Considered another limitation in this study of WTP (Willingness-To-Pay) for green electricity is the small sample size, only 120 residents were asked to submit the survey regarding WTP (Willingness-To-Pay) for green electricity and almost maximum of respondents were graduated.

Appendix A – Main part of the survey Questionnaire

Part 1 – Questions regarding WTP (Willingness-To-Pay) for green electricity

Type A – Q1. Are you willing to contribute to the generation of Green electricity in person every month?
YES – directs to Type-AQ2
NO – Done with part 1 proceed to Part2
Type A – Q2. If yes, would you be willing to pay an additional amount of Rs 300/month for renewable energy?
YES – directs to Type-BQ1
NO – directs to Type-BQ2
(Instruction: If the answer to Type-A Q2 is "Yes", then answer Type-B Q1. If the answer to Type-A Q2 is "No", please answer Type-B Q2 and remaining)
Type-B – Q1. Instead of a levy of Rs.300/ month, would you be willing to pay an increased levy of Rs.450/month for renewable energy? Again, please remember, this is going to be a permanent feature in your bills.
YES –Donewith part 1 proceed to Part2
NO – Donewith part 1 proceed to Part2
(Instruction: If the answer to Type-B Q1 is "No" then answer Part 2)
Type-B- Q2. Instead of a levy of Rs300 / month, would you be willing to pay a reduced levy of Rs.150 /month, for renewable energy? Again, please remember, this is going to be a permanent feature in your bills.
YES – Done with part 1 proceed to Part2
NO –Donewith part 1 proceed to Part2

Part 2 – Basic questions regarding green energy to analyze the willingness price

Q1. At what price would you consider paying for green electricity to be so expensive that you would not consider buying it?
a. Rs.200/-
b. Rs.300/-
c. Rs.400/-
d. Rs.500/-
Q2. At what price would you consider paying for green electricity to be priced so low that you would feel happy to contribute to the betterment of India's environmental emission issue?
a. Rs.200/-
b. Rs.300/-
c. Rs.400/-
d. Rs.500/-
Apart from the main WTP questions of the survey were also asked respondents to respond to their socio-demographic data such as name, age, gender, occupation, education, and environmental conscious questions for better interpretation of results.

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