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Report

Proceedings Report

On

Home Electricity Footprint Webinar

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Creating Innovative Solutions For A Sustainable Future

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1.0 Introduction

1.1 Background

Residential electricity consumption in India has increased over 50 times since 1971. Currently, this sector accounts for 24 per cent of the total electricity consumption. In this sector, lighting and cooling requirements constitute 75 per cent of the total electricity consumption. As per the Power System Operation Corporation Limited report, lighting load in India's residential sector is 11344 MW. Enhancing energy efficiency will be the key in controlling energy demand and transitioning towards a low-carbon future.

Indian Electricity Act, 2003 provides an overarching framework for enhancing energy efficiency in the residential sector. The Government has been promoting energy efficiency through initiatives such as Bureau of Energy Efficiency (BEE) Standards and Labelling Scheme, outreach activities, incentives for adopting and manufacturing energy efficient appliances (Bachhat Lamp Yojana, Super-Efficient Equipment Programme) and voluntary building codes (Energy Conservation Building Code that have been made mandatory for commercial buildings). Moreover, with BEE periodically revising energy efficiency standards, the role of information and market-based instruments becomes critical in driving consumers towards more energy efficient appliances as the technology advances.

TERI has over the years worked with multiple government organizations to create awareness about energy conservation and management. One such project was the "Vidyut Jagruthi Yojana", which was aimed at creating a comprehensive energy education and conservation programme across 100 educational institutions, covering 50,000 students in the city of Bengaluru, Karnataka. Another project, "Sustainable Educational Institutions" which is a TERI-Hindustan Aeronautics Limited (HAL) initiative was aimed at installing rooftop solar PV systems on Government educational institutions and creating awareness among students and teachers on renewable energy and efficient use of energy.

One major learning from both the projects was the dearth of knowledge and awareness about energy consumption of basic household appliances not just among the students but also the teachers, mentors and parents. The need to conserve energy was well accepted by all but due to lack of information, not much action was being taken. Thus, even though the Government has implemented necessary measures and provided star rated appliances/products, the consumers are not much aware of the actual benefits of said products. As future decision makers, it is of prime importance to educate students about their own energy consumption and about energy efficiency opportunities at household level.

Under the current lockdown situation due to the Covid 19 pandemic, TERI recognised the opportunity to create awareness and disseminate information about household electricity consumption by means of a webinar. The webinar was organized on Saturday, 2nd May, 2020. To widen reach of the webinar, it was scheduled on a Saturday, when most parents and students would be free to participate.

1.2 Objectives of the webinar

- Create awareness about electricity usage at household level;
- Provide better understanding of the electricity bill;
- Create awareness about energy efficient appliances;
- Create awareness about energy efficient practices;
- Bring about credible behavioural change.

1.3 Webinar Partnership

TERI in collaboration partnership with Copenhagen Centre on Energy Efficiency, an institutional part of the UNEP-DTU partnership organized the webinar. The Copenhagen Centre on Energy Efficiency (Copenhagen Centre) is dedicated to accelerating the uptake of energy efficiency policies and programmes at a global scale. In the context of the United Nations Secretary General's Sustainable Energy for All (SEforALL) initiative, the Copenhagen Centre is the thematic hub for energy efficiency with the prime responsibility to support action towards the SEforALL energy efficiency target of doubling the global rate of improvement in energy efficiency by 2030.

2.0 Webinar Format & Summary

The webinar "Home Electricity Footprint" was aimed at creating awareness about household electricity consumption and opportunities to reduce the same. It was organized in partnership with Copenhagen Centre on Energy Efficiency.

The webinar was started by moderator and tone of the webinar was set by Mr. Rahul Raju Dusa, senior expert-energy efficiency UNEP DTU partnership. He spoke about the work being carried out by UNEP DTU partnership and Copenhagen Centre on Energy Efficiency and why they have partnered with TERI for organizing this webinar. Mr Rahul mentioned that children are going to be the major energy consumers in the future and they need to understand the key environmental and energy related issues within their region to become informed decision makers.

The webinar was designed to meet the level of understanding of students from class 6 onwards. The content of webinar was split into three parts;

Part I: Basics of electric energy

Part II: Power consumption by different household appliances

Part III: Energy saving opportunities in household appliances.

In **part-1** the participants were presented with the basics of electric energy such as definition energy and power by also illustrating their differences with respect to their units (kW, kWh) and their application. It also included details about different forms of energy and components of electric energy.

In **part-2**, the participants got glimpse of power consumption by different household appliances which include:

- **Lighting appliances** – Fluorescent tube light, incandescent bulb, LED tube light, LED bulb, CFL bulb and night bulb;
- **Kitchen appliances** - Refrigerators, rice cooker, bread toaster and electric water kettle;
- **Entertainment appliances** - Laptop, television and Wi-Fi router;
- **Heating & cooling appliances** - Air conditioner, fan and electric water heater;
- **Cleaning appliances** - Vacuum cleaner, washing machine and electric iron and
- **Other appliances** - Printer and water pump.

Apart from this, participants also learnt the importance of "Tag Detail or Product Brochure" to know actual power consumption by electrical appliances. Once the details on actual power consumption was explained to the participants, the presentation focused on providing simple methodologies to the participants to calculate the monthly electrical energy consumption by individual appliances. The webinar covered one of the most essential points, i.e. understanding and analysing the electricity bill, which plays vital role in knowing ones expenditure on electricity.

In **part – 3**, the main focus was on energy saving methodologies which are straight forward and easy to follow by individuals at home. In webinar the energy saving opportunities were divided into three categories,

1. Proper utilization of electrical appliances,
2. Technology upgradation
3. Energy saving by reducing standby power consumption.

Under **proper utilization of electrical appliances**, the focus was on energy savings brought about by behavioural change. Following energy conservation measures were discussed during webinar and associated energy saving potential was also highlighted using case examples:

- Switch OFF lights, fan and other appliances whenever not used. Although at individual household level the electrical energy saving by switching OFF fans and light is minimal but at a country level the saving is huge.
- Set the temperature of air conditioner above 24°C. By doing so 3-4% power can be saved.
- In peak summer, instead of reducing the air conditioner temperature to 20-21°C or further low, use ceiling fan at optimal speed and set the temperature of air conditioner at 24°C.
- Set the timer in air conditioner to automatically switch OFF, during early morning hours when outside temperature is low and reduce the heat load of room.
- Do not open the door of refrigerator frequently and for long time.
- Do not place hot food and also open food inside refrigerator. As open food will generate moisture and increase the load on refrigerator compressor.
- Do not keep refrigerator temperature too low.
- Set the temperature of electric water heater at 50–60°C.
- Avoid grinding of dry material in food processor.
- Avoid baking of large food items in microwave.
- Always use washing machine at full load.
- Prefer natural drying of clothes and avoid using electric dryer.

In **technology upgradation** the emphasis was on motivating the participants to opt for higher star rating appliance which consume less electrical energy and also shows energy saving potential by replacing conventional electrical appliances with energy efficient appliances. Appliances discussed in webinar for upgradation are:

- Conventional fan with energy efficient brush less DC fan which consume almost 50% less power;
- Filament lamps or CFL with LED lamps;
- Electric water heater with solar water heater;
- Non inverter AC with inverter AC;
- Non inverter refrigerator with inverter refrigerator.

In last section of energy saving opportunities, **minimizing standby power consumption**, the priority was given to explaining the concept of standby power and how it often leads to substantial increase in electricity cost. The amount of standby power consumption by different appliances was also discussed which will help participants to visualize the

significance of energy loss by standby power. The top five standby power guzzlers present is our house are:

- Television
- Desktop computer
- Music system
- Satellite TV box
- House hold appliances with clock (Ex. Microwave, Radio etc)

Before concluding the presentation, an attempt was made to demonstrate an example to explain that just by switching OFF appliances through main plug point whenever not required can help in reducing the standby power losses.

At the end of the webinar, a small task was given to all the participants to motivate them to calculate their household energy consumption. The task was intended to help participants find the major electrical energy consumption appliances present in their house and to identify energy saving opportunities exists in their house. The participants were asked to complete the task in four steps and submit the task results.

Step 1: Participants need to analyse their electricity bill and have to find monthly electricity consumption, monthly fixed charges, monthly energy charges, taxes and other charges.
Step 2: From monthly electricity consumption, participants need to calculate daily electricity consumption.
Step 3: Participants have to calculate appliance wise energy consumption.
Step 4: Participants have to identify energy saving opportunities exist in their house.

A certificate was given to all the participants who completed the task within given time frame.

Summary

The webinar on "Home Electricity Foot-Print" was organized with the motivation to create awareness among large group of society about their monthly electricity consumption pattern and energy saving opportunities which exists in their house. This will help individuals to reduce their monthly electricity bill. The first part covered the basics of electrical energy. It was also explained how to identify which electrical appliance in house will consume maximum power. In second part of webinar, the participants were introduced to methodologies of calculating their monthly electrical energy consumption and analyse their electricity bill. In third part three different types of energy saving opportunities were discussed, which includes energy savings through proper utilization of electrical appliances, through technology upgradation by replacing old inefficient appliances with new energy efficient appliances and energy saving by reducing standby power. The webinar also explained the importance of star label in electrical appliances. Before concluding the webinar, a task was given to all the participants to do their own home electrical energy audit. A certificate was issued to all the participants who successfully completed their task within the set time frame.

3.0 Participation Details

The Home Electricity Footprint Webinar was conducted in an interactive learning approach. The webinar was used as a platform to create awareness on home energy efficiency and to bring about behavioural change with an ultimate aim to achieve reduction in residential energy consumption.

The available IT infrastructure extensively helped in successfully organising the webinar by connecting all the stakeholders from different parts of the world. The webinar was organized by TERI's Bengaluru team stationed at Bengaluru and Mangalore. The main server for this activity was controlled by IT team from Delhi. The speaker for the programme was stationed in Rajasthan and the moderator from Bengaluru. Once the programme was announced, the team from the TERI head office located in Delhi engaged in spreading the programme to many schools across the country through the platform which was developed earlier for other school related projects. The Industrial Energy Efficiency Group of TERI Bengaluru also shared the details of the programme with their clients, partners and stake holders around the country as well as across the globe.

3.1 Webinar Registrant Details

The circulation of brochure/ flyers for the programme was carried out for over a week's period and total of 1381 participants registered during the process. The flyer for the programme is attached in **Annexure 1**. Registrants were mostly students, homemakers, educationalists and other professionals. The students were mainly from class 6th to 10th, Pre-University, diploma, degree, ITI, under graduation, post-graduation and PhD level. The educationalist included teachers, mentors, professors, lecturers, institute heads. Similarly, the homemakers included housewives, retired professionals and senior citizens. Others were mainly professionals from various sectors. The registration list is attached in **Annexure 2**. A brief representation of the registrant's background is illustrated below:

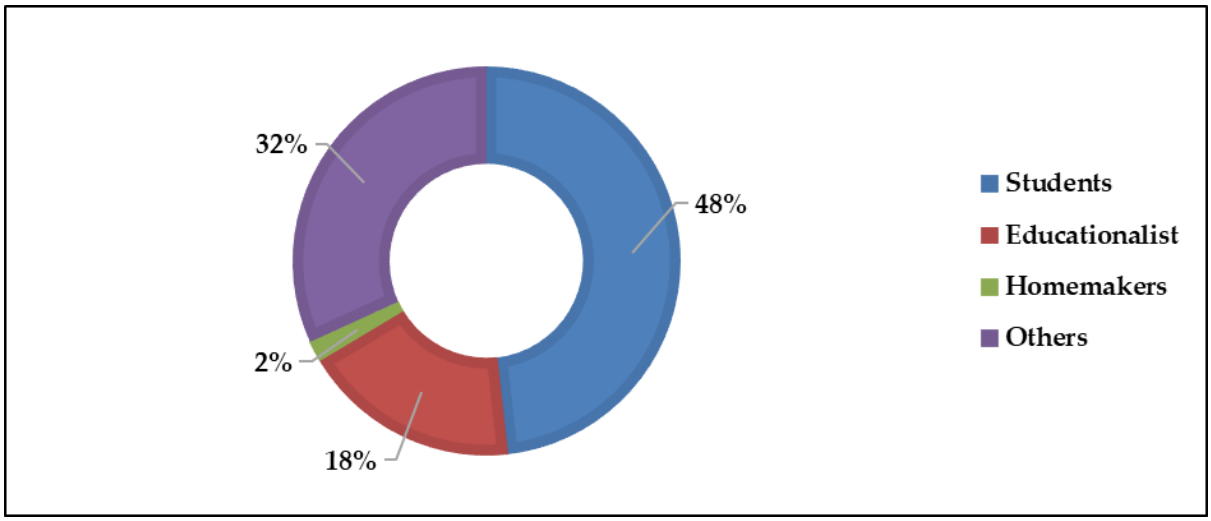

Figure 1: Percentage distribution of registrant's category

Out of all the registrants, 36% (502) were female and 64% (879) were male. Gender-wise representation registrants are illustrated below:

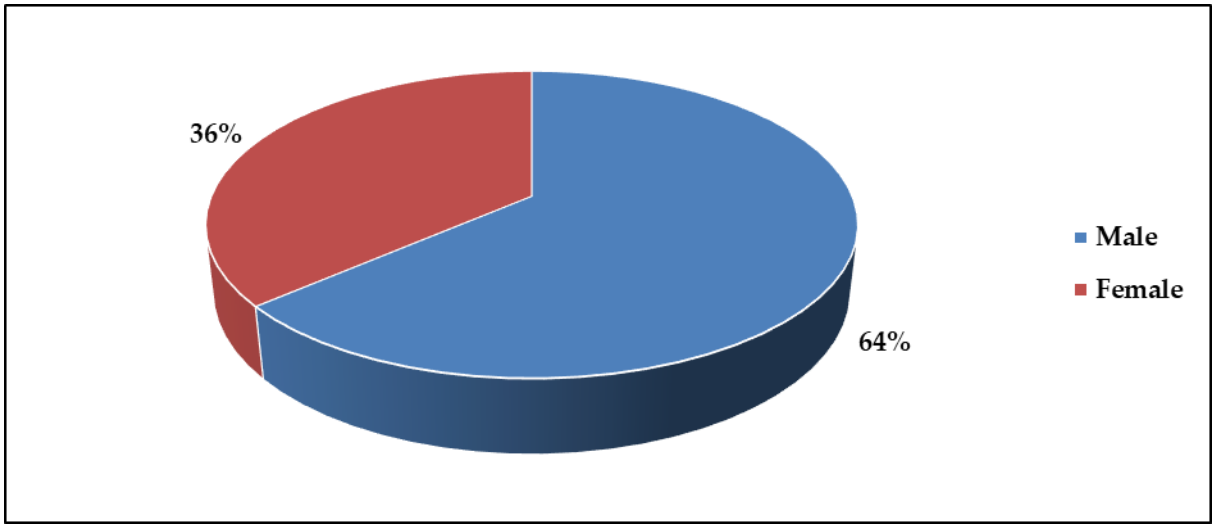

Figure 2: Gender wise representation of registrants

The collaboration between TERI and UNEP DTU, Copenhagen Centre on Energy Efficiency was facilitated by Mr Rahul Raju Dusa, Senior Expert – Energy Efficiency stationed at Hyderabad, India. Both teams had a review meeting on Friday, a day before of the webinar was conducted. In the meeting, the approach for the programme and all the arrangements leading to the programme were discussed in detail. UNEP DTU had shared their inputs and experience with TERI and had circulated the programme invite to their stake holders and partners for the viewing of the programme.

3.2 Webinar Attendee Details

The webinar was showcased via zoom application which was limited to 500 participants. As the number of registrants were 1381, TERI IT team provided live stream on you tube in case of difficulty connecting through zoom and or if the attendee's number are above 500. Till date the video on YouTube has been viewed more than 2200 times. The YouTube link is:

https://youtu.be/X1hZ6v_bDds

The total participants for the webinar on zoom were 612. This includes participants who had initially joined through Zoom but later shifted to YouTube and their entire family have attended the session together. Same was mentioned in feedback emails. During the live session, the maximum viewership at zoom application at any moment was 462 participants and the total number of viewers in you tube were 174 participants at live session. Those who missed the live session had watched the session later and the viewership increased to 501 in the span of 2 hours after the live session. The attendee list of zoom application is attached in **Annexure 3**.

During the programme, most of the queries were in the form of chats as the session was restricted to 1-hour time interval. There were 136 chats in the application during the course of the session, out of which 60 were queries and same were responded to during the session. A brief representation of the attendee's background is illustrated below:

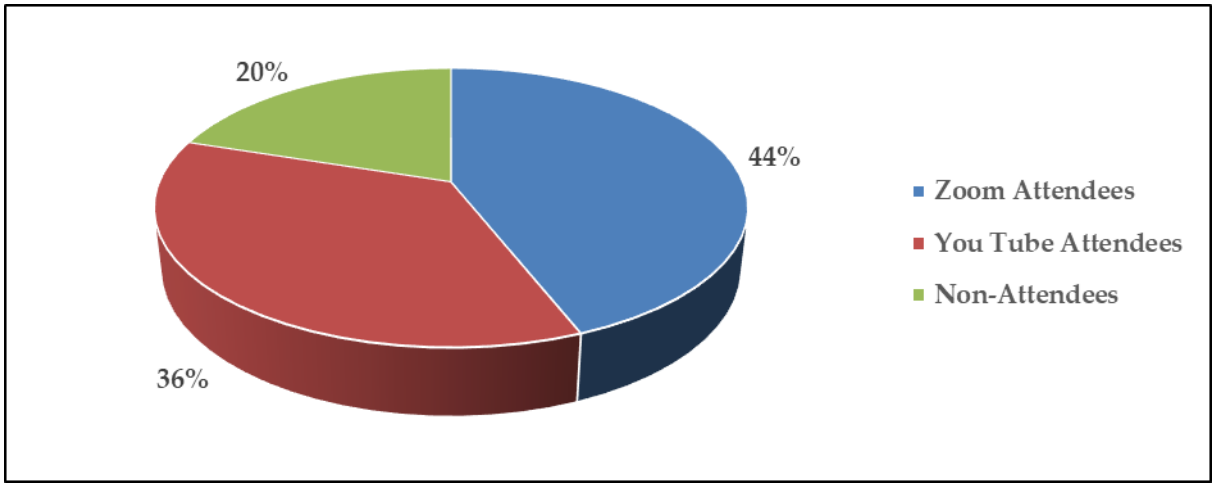

Figure 3: Percentage distribution of attendees.

Apart from India, good number of viewers was from Canada, Denmark, Guyana, Japan, UAE, USA, and Uzbekistan.

4.0 Assigned Task Completion Summary

At the end of the webinar, a task was assigned to all the participants and on successfully completing the task, e-certificate was handed over from TERI & UNEP DTU. The task assigned was for the self-assessment of energy consumption at individual home and identify measures for reducing the same. The following tasks were assigned to all the participants;

1. Take a latest electricity bill copy and identify the following:
    - Monthly electricity consumption
    - Monthly fixed charges
    - Monthly energy charges
    - Taxes etc.
2. From monthly electricity consumption, calculate daily consumption (in kWh)
3. Calculate appliance wise energy consumption
    - Observe your daily appliance usage pattern (in hours)
    - Prepare a summary of appliance wise power consumption (in kW / kWh)
    - Use the formula shared earlier to make this calculation
4. By observing daily usage pattern, try to identify opportunities to reduce your home electricity bill

4.1 Analysis of the Task

Out of all the attendees during the session, total of 200 attendees have completed and submitted the assigned task. Only participants who have completed and submitted the task were provided e-certificates from TERI & UNEP DTU for this particular webinar. Figure below shows the percentage of participants who completed the task.

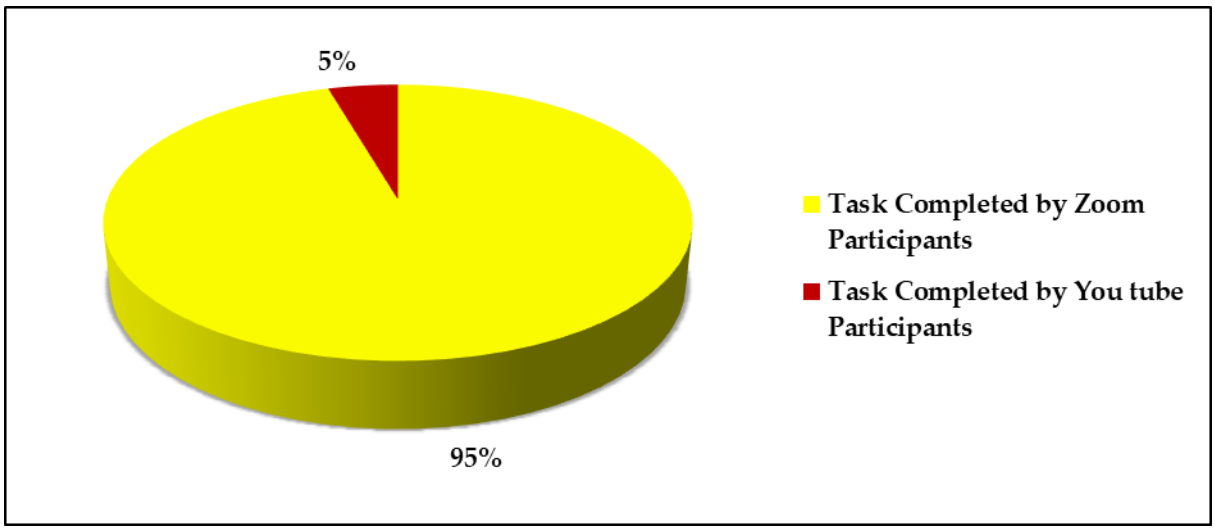

Figure 4: Representation of task submission by participants.

Out of the 200 participants who have submitted the task, 191 participants were registered participants and 9 were unregistered participants. Unregistered participants have submitted

the task after viewing the programme through you tube. Out of all the participants who submitted the tasks, 43% (86) were female and 57% (114) were male. Gender-wise representation registrants are illustrated below:

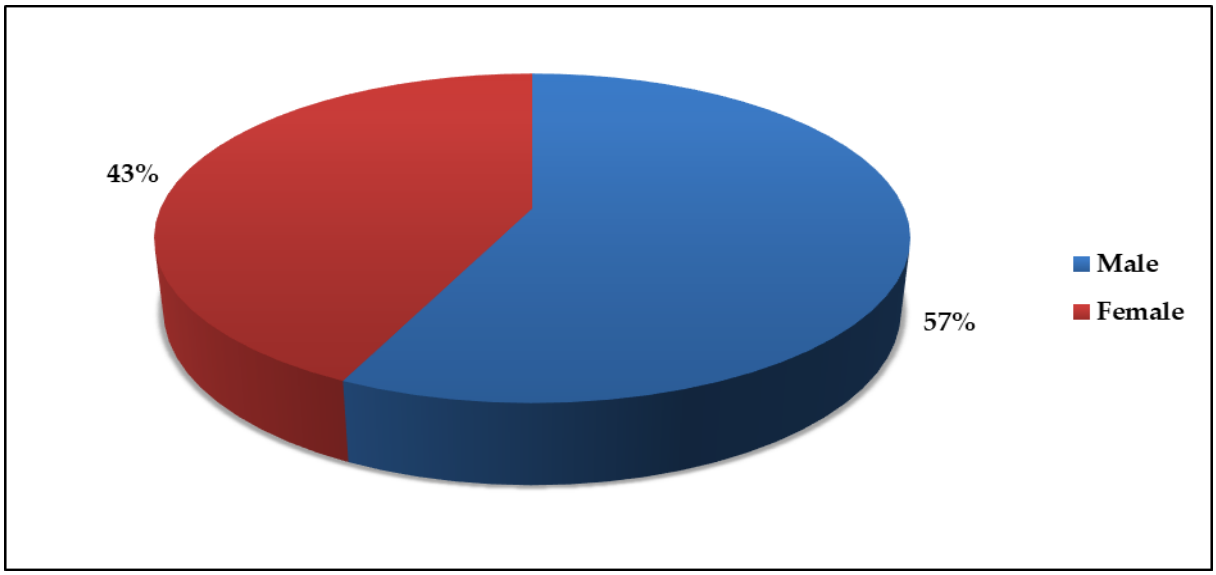

Figure 5: Gender-wise representation of task completed participants.

4.2 Strategic Analysis

On the basis of the task submitted, the participants are segregated depending on the electricity consumption at their households. The categories are:

- Household electricity consumption less than 100 kWh – Low energy consumers
- Household electricity consumption between 100-200kWh – Moderate energy consumers
- Household electricity consumption between 200-300 kWh – High energy consumers
- Household electricity consumption greater than 300 kWh – Very high energy consumers

A representation of the participants based on electricity consumption at household is illustrated below

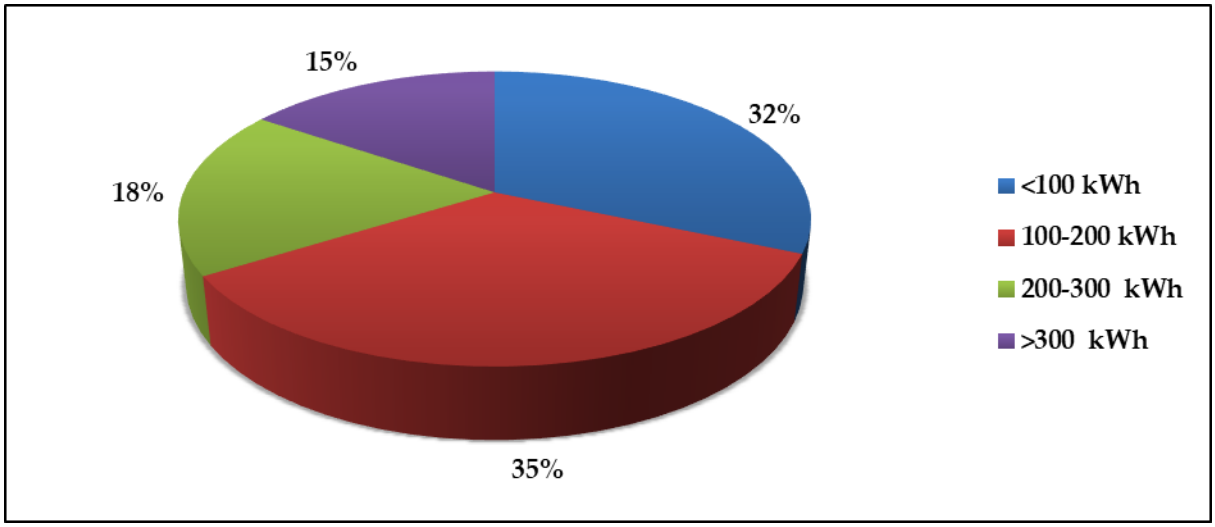

Figure 6: Household electricity consumption of participants

Along with the electricity consumption details, the participants also showcased opportunities for reducing their electricity consumption. The energy conservation opportunities highlighted by participants are segregated into 3 major categories:

1. Behavioural changes (without investment& by changing usage pattern)
2. Improving operation of existing appliances (with minimum investment)
3. Replacement with new technology/ star rated equipment

From analysis it was observed that, 92%participants identified energy savings by proper utilization of electrical appliances including reduction in stand-by power. Also, 68% participants are willing to do the low cost investment for electricity savings (like replacement of conventional fans and lights with energy efficient fans and lights) and 38% participants said they will replace old AC & refrigerator with inverter AC & refrigerator. Also, 86% participants said they will purchase high star rated electrical appliances in future. A representation of the strategies to reduce energy consumption of the participant's background is illustrated below:

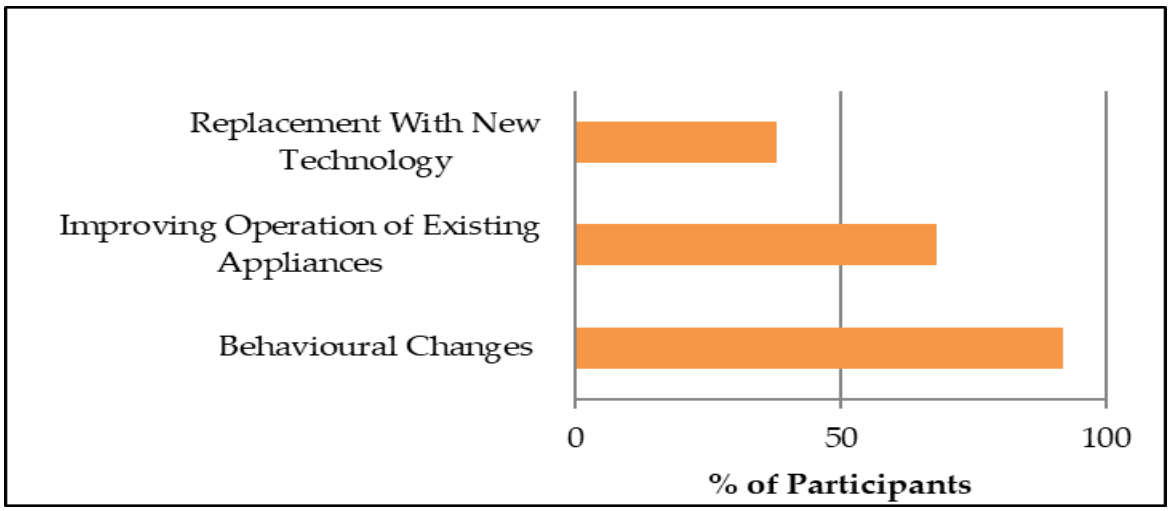

Figure 7: Participant's response towards energy conservation strategies.

5.0 Participants Feedback

The participants were provided with a link to Google feedback forms created by our team to fill in and share their responses after the programme. We received responses from 315 participants which were further assessed for necessary customization as per participant's requirements in upcoming webinars. The rating system was grouped as per the following scale:

Score	Category
9 to 10	Excellent
6 to 8	Good
3 to 5	Moderate
1 to 2	Poor

Summary of the participant feedback is illustrated below:

Q1: How the training program was conducted and presented?

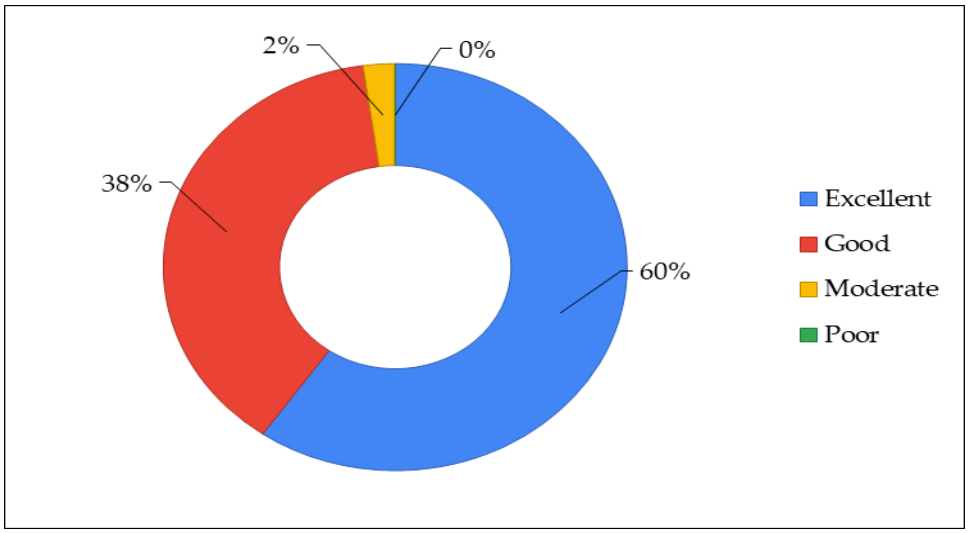

Figure 8: Participant's feedback on training program quality.

Q2: Whether the curriculum of the program is meeting the defined objectives?

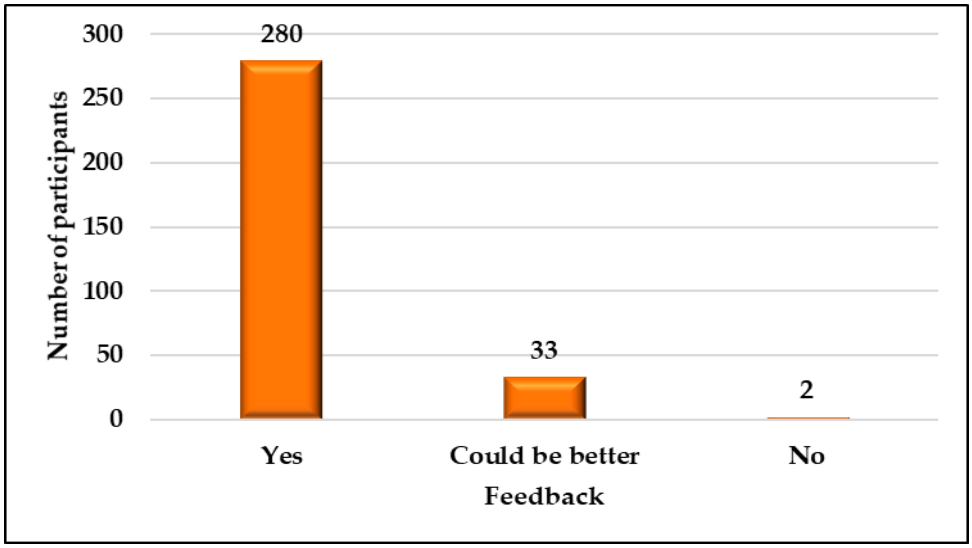

Figure 9: Participants' response about curriculum of the program is meeting the defined objectives

Q3: Whether the topics covered were informative?

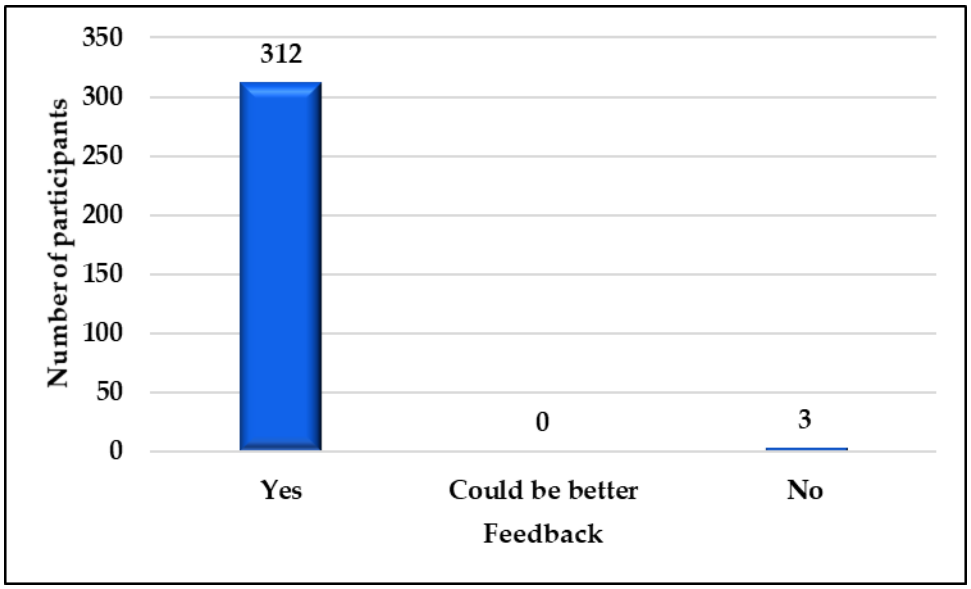

Figure 10: Participants' response on webinar's topic coverage

Q4: Are you more likely to check star rating of equipment before purchasing?

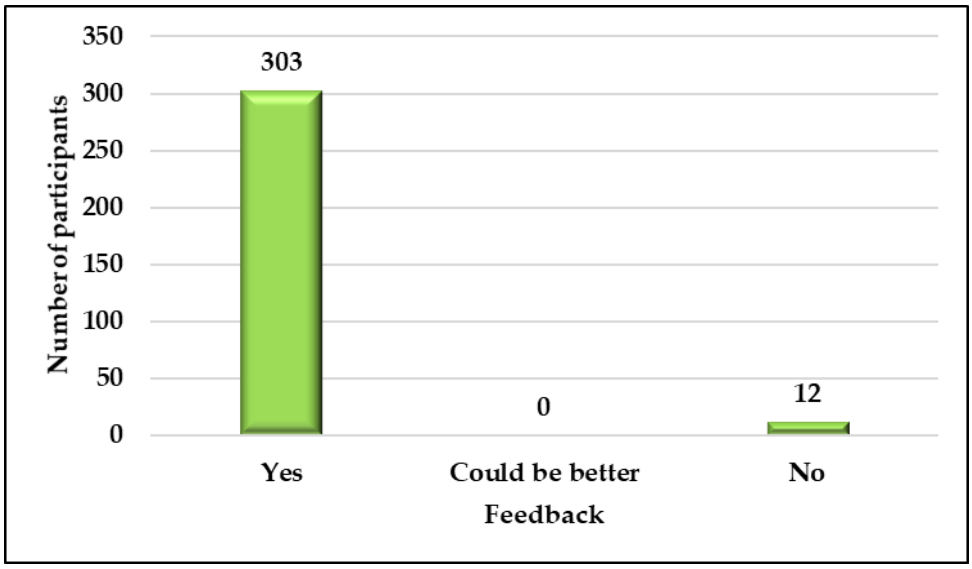

Figure 11: Participant's response about checking star rating of the equipment before purchasing

Q5: Has the webinar made you more aware of your electricity footprint?

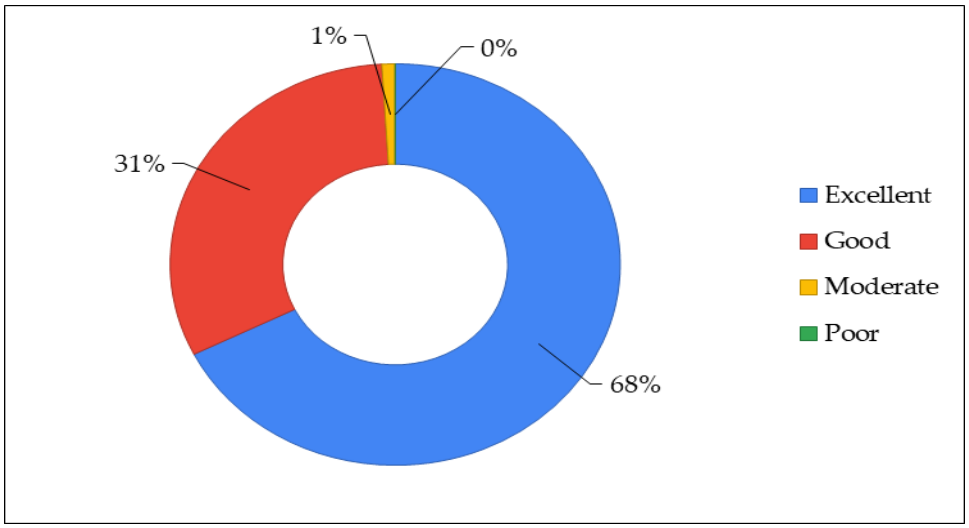

Figure 12: Participants' response on awareness created by the webinar.

From Q1 - Q5, overall, 96 % of the participants have found the webinar good or excellent.

Q6: Any other topic you would want us to cover? Why?

Some of the areas which the participants majorly want us to cover, as mentioned in the feedback forms were

- Domestic solar PV systems, as it is more demanding on the basis of current situation;
- Creating awareness in sustainable rural electrification and its usage;
- Future of Electric Vehicles;

- Industrial energy audit, use of latest energy efficient technologies and measures to conserve energy;
- Effective utilization of renewable energy resources, the need of the future;
- Carbon credits and carbon offsets;
- Water conservation and management practices;
- Internet of things for industries;
- Environmental Management with Occupational Health and Safety Management.

Q7: Please share more comments on the programme which would help us better in the future.

Participants also shared productive aspects about which the training could be further improved, majorly

- Requesting for focused webinar with respective individual topics and also the target audience;
- Requesting to organize the webinar programme in regional language for wider spread of information among students and teachers;
- Consider looking into the cause of the audio and network connectivity issues during the webinar to determine the problem and fix them. Considering a better platform for webinar would be appreciated;
- Preparing short picture on tips to save electricity with TERI logo to be circulated on social media like WhatsApp etc;
- Collaborating with TERI to conduct more of such webinars in schools, colleges and other educational institutes in order to inculcate or enhance the knowledge of energy saving, energy management and energy audit to the next generation of students/learners.

All the inputs from the participants have been considered and shall be taken into consideration for upcoming webinars.

6.0 Conclusion

Households mainly use electricity for lighting and electric appliances (fans, refrigerators, TVs, water heaters, air coolers etc.). The large majority of individuals - mostly, middle and low income - promptly switch off appliances (e.g. lights, ceiling fans, television sets, etc.) when not in use. Today many household consumers are willing to buy energy efficient appliances instead of cheaper lower efficiency models. It was also revealed from Home Electricity Footprint webinar feedback that higher adoption of energy efficiency technology is happening in India.

Energy efficiency enables enhanced productivity and helps in keeping global warming under two degree Celsius above pre-industrial levels, the legally binding objective of the Paris agreement, a step closer to meeting the Intended Nationally Determined Contribution's targets. Thus, energy efficiency target seems to be a 'win-win' strategy on essentially all accounts. Every unit of energy saved, either on account of technological advancement or behavioral change, implies a unit that does not need to be produced.

Moreover, goal seven of the Sustainable Development Goals aims to "ensure access to affordable, reliable, sustainable and modern energy for all" wherein, third sub-target focuses on doubling global rate of improvement in energy efficiency by 2030. Energy savings can thus be used to power more households.