

# *Efficiency Standards for Water Heaters in Pakistan*

## Consultative Meeting Proceedings

4th October 2021

Serena Hotel, Islamabad Hosted by NEECA & CLASP



## Background

As part of the effort to address the national gas shortage facing Pakistan, NEECA is undertaking a range of actions seeking to reduce gas consumption across the economy. One of the actions is the revision of efficiency standards for water heaters, and the potential parallel introduction of product efficiency labelling. CLASP is providing technical support in this development process.

## Objective

The main objective of the meeting was to share with key stakeholders projections for water heater energy and gas consumption (and cost) under varying scenarios, and the potential savings that regulation and associated policy interventions may bring in Pakistan. Additionally, the meeting aimed to gain a buy-in on the regulating approach that may be most appropriate.

## Agenda

The following agenda was followed at the consultative meeting.

**Managing Director, NEECA cordially invites you to  
A meeting on Efficiency Standards for Water Heaters in Pakistan  
Hosted by: CLASP & NEECA**

**Venue:** Nazara Hall, Serena Hotel Islamabad

**Time:** 11 am to 1.00 pm.

**Date:** 4th October, 2021

TIME	AGENDA ITEM
11.00 – 11.10 am	Round of Introductions
11.10 – 11.25 am	<b>Welcome note</b> - Background, & briefing on planned actions by NEECA <i>Dr. Sarदार Mohazzam, Managing Director, NEECA</i>
11.25 – 11.40 am	Introductory brief on national demand/supply of gas and feedback from previous workshop <i>Asad Mehmood, Manager Technical, NEECA</i>
11.40 – 12.00 pm	Household and national level modelling of energy consumption of water heaters <i>Muhammad Salman Zaffar, Technical Lead, CLASP</i>
12.00 – 12.30 pm	Regulatory options and proposed performance levels <i>Stuart Jeffcott, Team Leader, CLASP</i>
12.30 – 12.45 pm	Q and A session
12.45 – 1.15 pm	LUNCH and informal chat

## Proceedings:

Following is a brief account of the presentations given by team members (CLASP / NEECA).

Muhammad Salman Zaffar welcomed all the participants and there was a round of introductions. Salman spoke briefly giving context to the meeting before proceeding forward.

### **Dr. Sardar Mohazzam – Managing Director, NEECA**

Dr Sardar Mohazzam, MD NEECA congratulated HIMA<sup>^</sup>Verte and CLASP for the progress and efforts in developing efficiency regulations. Dr Mohazzam gave a background of NEECA and the current projects in progress under NEECA. Dr Mohazzam then spoke on the national shortage of gas and cautioned that the coming winter will be hard on gas consumers. He said that there is a dire need for efficiency interventions and a push from government to switch from gas to electric appliances.

Dr Mohazzam said that organizations (both public and private) must work together to achieve efficiency and conservation goals with a priority given to gas appliances. NEECA is closely working with other governmental organizations such as PSQCA and SNGPL and the need for policy, standards and regulation on a urgent basis is the need of the hour.

### **Mr. Asad Mehmood – Manager Technical, NEECA**

Mr. Mehmood started with a short recap of the information provided by NEECA in the first workshop, shedding light on the national demand/supply forecasts of natural gas. He followed by giving introduction to NEECA and its transformation from ENERCON to NEECA. NEECA was provided with a new mandate of initiating, catalyzing and coordinating energy efficiency and conservation in the country.

Mr. Mehmood highlighted that NEECA is coordinating with many sectors of government including power, transport, building, industrial and agriculture. He described in detail NEECA's function which included policy formulation, legal and financial assistance, program development and conducting awareness campaigns. NEECA's greater goal is to save 3 MTOE in various sectors by 2023 and has successfully developed draft energy standards for Air conditioners, Refrigerators, motors and fans, ballasts and CFL's. In addition, labelling and registration scheme for fans has also started.

Mr. Mehmood concluded his presentation by talking about the current government actions to conserve gas which included carrying out validation of gas based captive power plants. NEECA also plans to hold design competitions to develop efficient water heater units and parts. As a final point, Mr. Mehmood said that the government is likely to decrease electricity tariffs while increasing tariffs for gas during winter months.

*There was a short Q&A session to give a chance to manufacturers to share their thoughts. The manufacturers identified the lack of testing facilities for water heaters as a major issue. Salman informed the participants that as the consultative process moves forward and test methods are finalized; manufacturers will be consulted and kept in loop. Furthermore, once test methods are arrived upon CLASP and NEECA can guide them on how and where to test (as well as on testing at their own plants). The subject of lab availability can be better addressed at that stage too. The CEO of TESLA commented that the efficiency of water heater depends a lot on operating conditions. It is hard for manufacturer to produce efficient products when the rated supply pressure is often not provided by gas utilities. The representative from SNGPL acknowledged the difficulties in gas supply and was keen on developing a way forward together.*

### **Mr. Ali Hassan Habib – National Team Lead, CLASP**

Mr. Habib recapped the main points from the first workshop that identified the need for regulations for gas appliances and gave the stakeholders an introduction to standards and labels. He also highlighted the salient points learned from the gas water research which showed that there is much room for improvement in the efficiency of water heaters currently sold in Pakistan and an acute shortage of testing facilities. The workshop showed that the existing standards are not up to the mark and there is a lot of potential to improve components i.e.: burner efficiency/ tank efficiency etc. He concluded his presentation by mentioning that the last workshop provided a forum for all stakeholders to engage and contribute in the development of water heater regulations that benefit all stakeholders. Manufacturers supported the goals of the government and would like to develop more efficient water heaters for the Pakistani market. The government in turn is also eager to assist in making the transition to more efficient products.

### **Mr. Muhammad Salman Zaffar – Technical Lead, CLASP**

Mr. Zaffar presented the current picture of water heaters in Pakistan described as the 'Business As Usual' scenario. The sales and stock projections were shown to 2030 assuming there was no regulation or intervention. Mr. Zaffar then described the assumptions used to develop the projections. A market growth of 4-5% was used while the average household was assumed to have either 1.5 gas storage/2.25 gas instant/1.5 electric water heater units. The lifetime of gas storage, gas instant and electric storage was taken as 20, 5 and 12 years respectively. Salman then shared that estimates show that water heater sales will hit 1.2 million units and installed stock will reach 11.8 million units by 2030. He then went on to describe the performance of typical water heaters currently in the Pakistani market. The typical products were assumed to be 40-gallon gas storage, 10L/min gas instant and 40-gallon electric storage. A document with a list of assumptions used in the modelling were provided to the participants and is attached below as Annex 3.

*Manufacturers noted some of the assumptions were incorrect as the typical products used in Pakistan are as follows: 30 gallons – gas storage (nominally rated as a 35-gallon capacity), 6 L/min – instant gas, 20 -gallon – electric storage. Stuart thanked the manufacturers for their insight and mentioned the modelling can be easily changed to take into account the new typical products.*

Mr. Zaffar continued by showing the individual energy consumption of water heaters by type and presented graphics to visualize projections for energy, gas, emissions and cost on a national level. Salman also then identified that gas savings does not translate directly to energy, cost or emissions savings. Finally Salman pointed out that the tariff for electricity is considerably more expensive than gas and that gas would still be cheaper even after halving electricity tariffs.

### **Stuart Jeffcott - Team Leader, CLASP**

Stuart's presentation showed how Pakistani water heaters perform in comparison with international products and provided potential options for regulations. Stuart introduced the IEA 4E Benchmarking Report which compared the performance of water heating units in various countries. The performance parameters used in the report, e.g. 56 gallon hot-water demand with 6 draws per day, were applied to Pakistani water heaters to allow comparisons with these third countries, clearly demonstrating the current relative inefficiencies of the Pakistani products.

Stuart then presented two projection scenarios in Pakistan. Namely, the 'BAT (Best Available Technology) Scenario' which replaces Pakistani units with the best performing units in the Benchmarking report and the 'Efficiency Scenario' which replaces Pakistani units with the worst performing unit in the benchmarking report. The area between BAT and BAU defined the saving envelope. Stuart highlighted that there is a difference between what is possible and what is

practical in Pakistan. Shifting to BAT in short timeframe is unachievable but 'Efficiency scenario' is more practical and achievable.

Stuart went on to describe the different regulatory frameworks and the ease or difficulty in development and implementation of each. Regulations can be a technology-neutral service-delivery, best-product service delivery, a parameter or construction based regulation. Stuart mentioned that the Parameter based regulation will be most effective in Pakistan and the current PSQCA standard, although needing updating, is a parameter-based regulation. Stuart then described the PSQCA test method and performance levels. He identified that the PSQCA test method does not correspond to in-use conditions i.e. storage at 45C instead of 70C. A sheet with initially proposed performance levels was handed out to all participants (also included in Annex 3).

### Discussion

*Tesla representative then told the workshop that they have attended similar meetings to regulate water heaters in the past. He mentioned three main areas where efficiency can be improved; thermal efficiency, burner design and insulation. He also remarked that the quality of water heaters has decreased in Pakistan Insulation has deteriorated and the burner now ignites every 3-4 hrs compared to 8-10 hrs in the past. Tesla also stressed on the importance of using timers as an achievable method of conservation.*

*The representative from Waves/Singer agreed with Tesla and emphasized the need for testing facilities. The MD NEECA queried the manufacturers about whether they will be willing to go into Private-Public Partnership to develop testing facilities for water heaters. The manufacturers said they would be willing to contribute to establishing testing laboratories. Tesla then gave some recommendations e.g. a design can be provided for burners. The manufacturers expresses concern about how smaller manufacturers could be regulated. Tesla also remarked that Pakistan can follow steps already taken internationally instead of having to reinvent the wheel. MD NEECA said they would help establish testing labs and will conduct design competitions for efficient water heaters. PEECA has successfully established an AC lab in collaboration with UET. The MD also remarked that setting up a lab could be a fruitful business venture. Golden Fuji representative inquired whether imported items would be regulated.*

*Stuart answered saying anything sold in the Pakistani market will have to adhere to the decided regulations.*

After the Discussion the workshop concluded and continued to lunch for informal discussions.

## Key Takeaways:

Broad agreement was reached on the following:

- Existing PSQCA testing and performance standards are currently not appropriate for purpose as:
  - The scope does not include electric water heaters which are likely to be of increasing importance in the future (particularly with the political drive to move home appliances to electricity as the prime energy source)
  - They currently do not address in use conditions
  - Are weak relative to international comparative requirements.

Agreement was reached that PSQCA and suppliers are open to the revision of both the testing and performance requirements, but ideally revisions will be based around existing internationally used approaches, although tailored to Pakistani conditions if required. Proposals are to be made to PSQCA prior to the next workshop where they will be presented to the wider group.

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- Potential performance requirements will also be presented in the following workshop and, pending revisions necessary based on revised test methodologies, these will be formulated around the “worst performing” products identified in the 4E Benchmarking.
  - Investigations will be made into current supplier (and other) testing facilities, and how this may be upgraded in the short term to allow initial regulation as more formal laboratories are developed. NEECA will also investigate opportunities for public/private partnership development of laboratory(s).
  - Projections for energy/gas/costs will be updated in line with updated information on typical products/usage gained during the workshop.

## Annex 1: List of participants

Sr No.	Organization	Name	Designation
1	PSQCA	Ashraf Palari	Director
2	SNGPL	Farrukh Majeed Bala	General Manager
3	SNGPL	Muhammad Hashim	Engineer
4	Tesla	Mr Amir	Director
5	Waves Singer	Danish Munir	Assistant Manager R&D
6	Intec (InstaGas)	Hassan Mehmood	Managing Partner
7	Golden Fuji	Muneeb Ur Rehman	Manager Technical
8	NEECA	Dr. Sardar Mohazzam	Managing Director
9	NEECA	Asad Mehmood	Manager Technical
10	CLASP	Stuart Jeffcott	Team Leader
11	CLASP/HIMA^Verte	Ali Hassan Habib	National Team leader
12	CLASP/HIMA^Verte	Salman Zaffar	Technical Lead
13	CLASP/HIMA^Verte	Amna Shahab	Consultant
14	CLASP/HIMA^Verte	Abdul Rehman	
15	CLASP/HIMA^Verte	Meekal Jamil	

## Annex 2: Selected photos from event:









## Annex 3: Base Assumptions

### Assumed Typical Products

• Gas Instantaneous	• 10ltr/min
• Gas Storage	• 40 Gallon
• Electric Storage	• 40 Gallon

### Assumptions for Operating Conditions, Use and Costs

• Household Daily Hot Water Usage (Gallons)	• 80 Gallon
• Number of draws per day	• 10 draws (10 x 8 Gallon)
• Operational days per year	• 180 days (6 month)
• Operational hours per day	• 24 hr
• Energy Costs	<ul style="list-style-type: none"> <li>• Electricity: 22.35 PKR/kWh</li> <li>• Gas: 4.98 PKR/kWh</li> <li>• (Gas 1460 PKR/kWh)</li> </ul>
• Number of units per household	<ul style="list-style-type: none"> <li>• 1 Gas or Electric Storage Unit per household</li> <li>• OR</li> <li>• 3 Instantaneous Units per household</li> </ul>
• Hot Water Temperature (°C)	<ul style="list-style-type: none"> <li>• Storage: 45C</li> <li>• Use: 45C</li> </ul>
• Cold Water Temperature (°C)	• 21C
• External (Ambient) Temperature (°C)	• 15C

### Assumptions for Performance Parameters

• <i>Parameter</i>	• <b>Business as Usual (BaU)</b>	• <b>Best Available Technology (BAT)</b>	• <b>Proposed</b>
• <b>Average Storage Heat Loss Rate (per hour)</b>	<ul style="list-style-type: none"> <li>• Gas Store: 4.41%</li> <li>• Elect Store: 4.41%</li> </ul>	<ul style="list-style-type: none"> <li>• Gas Store: 0.49% (USA)</li> <li>• Elect Store: 0.14% (Canadian)</li> </ul>	<ul style="list-style-type: none"> <li>• Gas Store: 2.14% (USA)</li> <li>• Elec Store: 0.66% (Chinese)</li> </ul>
• <b>Adjustment to heat loss rate</b>	<ul style="list-style-type: none"> <li>• 80%</li> </ul>	<ul style="list-style-type: none"> <li>• 0% (already included)</li> </ul>	<ul style="list-style-type: none"> <li>• 0% (already included)</li> </ul>
• <b>Heating (thermal) efficiency</b>	<ul style="list-style-type: none"> <li>• Gas Store: 65%</li> <li>• Gas Instant: 65%</li> <li>• Electric Store: 99%</li> </ul>	<ul style="list-style-type: none"> <li>• Gas Store: 87%</li> <li>• Gas Instant: 96%</li> <li>• Electric Store: 99%</li> </ul>	<ul style="list-style-type: none"> <li>• Gas Store: 70%</li> <li>• Gas Instant: 78%</li> <li>• Electric Store: 99%</li> </ul>
• <b>Heat-up energy (kWh)</b>	<ul style="list-style-type: none"> <li>• Instants: 0/1kWh/draw</li> </ul>	<ul style="list-style-type: none"> <li>• Instants: 0/1kWh/draw</li> </ul>	<ul style="list-style-type: none"> <li>• Instants: 0/1kWh/draw</li> </ul>
• <b>Pilot light consumption per hour (kWh/hour)</b>	<ul style="list-style-type: none"> <li>• Gas Store: 0.1 kWh/hr (assumes no electric ignition)</li> <li>• Gas instant: 0 kWh/hr (assumes all electric ignition)</li> <li>• Electric: 0 kWh/hr</li> </ul>	<ul style="list-style-type: none"> <li>• Gas Store: 0.1 kWh/hr (assumes no electric ignition)</li> <li>• Gas instant: 0 kWh/hr (assumes all electric ignition)</li> <li>• Electric: 0 kWh/hr</li> </ul>	<ul style="list-style-type: none"> <li>• Gas Store: 0.1 kWh/hr (assumes no electric ignition)</li> <li>• Gas instant: 0 kWh/hr (assumes all electric ignition)</li> <li>• Electric: 0 kWh/hr</li> </ul>