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Sri Lanka Sustainable Energy Authority

Report on Replacement of Inefficient Refrigerators in the Western Province

2024

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Executive Summary

The Sri Lanka Sustainable Energy Authority (SLSEA) has launched the Minimum Energy Performance (MEP) label and addressing to phase out the older refrigerators by replacing them with new, energy-efficient models equipped with the MEP label. This report presents a comprehensive economic analysis of the data collected from a refrigerator energy consumption survey conducted in the Western Province of Sri Lanka, finally aiming to analyse the related economics of an island-wide utility-driven programme. The research aimed to assess the energy consumption patterns, efficiency, and consumer behavior related to refrigerator usage in Western Province. The survey data revealed varying levels of energy consumption based on refrigerator type, age, and user practices. Observations indicated a strong correlation between the age of refrigerators and higher energy consumption, with older models being significantly less efficient. Based on the results and findings, highlighting the potential for energy savings for individual households and overall economy through the adoption of newer, more efficient models. The benefits are reflected through a comprehensive economic analysis and the consumption analysis further breaks down energy usage by demographic factors and appliance characteristics. This report reflects on the broader implications for energy policy and consumer education, suggesting that targeted interventions could significantly reduce overall energy consumption. This report also provides recommendations for improving energy efficiency in the residential refrigeration sector in the Western Province for both individuals and policymakers, supported by an economic analysis that justifies these recommendations.

Background

Sri Lanka Sustainable Energy Authority (SLSEA) has initiated a programme on replacement of old, inefficient refrigerators with new, energy-efficient, Minimum Energy Performance (MEP) labelled refrigerators. As a pilot study, the programme is conducted in the Western Province, Sri Lanka, covering Colombo, Gampaha and Kalutara districts, with on-site measurements at households that are willing to test their refrigerators on energy consumption. It was earlier estimated by SLSEA in 2010 that the refrigerator consumes 52% of the total electricity consumption of a typical home [1]. This study is to recognise the changes to the household energy balance and to develop a comprehensive programme to identify potential energy savings in phasing out the obsolete refrigerator fleet.

Main stakeholders of this collaborative project are Sri Lanka Sustainable Energy Authority, local Refrigerator Vendors [SINGER (Sri Lanka) PLC, Damro Company (PVT) Ltd and Abans PLC], National Ozone Unit of the Ministry of Environment Sri Lanka, Ceylon German Technical Training Institute, Recotel Lanka (Pvt) Ltd and INSEE Group. This partnership is formed to measure actual energy savings and to establish a comprehensive disposal network for discarded refrigerators and hazardous materials such as polyurethane and older refrigerants that cause ozone depletion or contribute to global warming.

Up to Aug 2024, 18 refrigerators have been awarded the MEP label issued by the Sri Lanka Standards Institute (SLSI) [2]. This label is a critical tool to identify energy-efficient and environmentally friendly products, in guiding consumers' purchase decisions. The MEP label is currently serving as a voluntary standard, but it is expected to be made mandatory, prohibiting the production, import and sale of non-complying refrigerators. The MEP label also includes the declaration of Global Warming Potential (GWP) and Ozone Depletion Potential (ODP), making Sri Lanka one of the pioneering countries to incorporate these environmental considerations into energy labelling, honouring the country's commitment to ratified treaties.

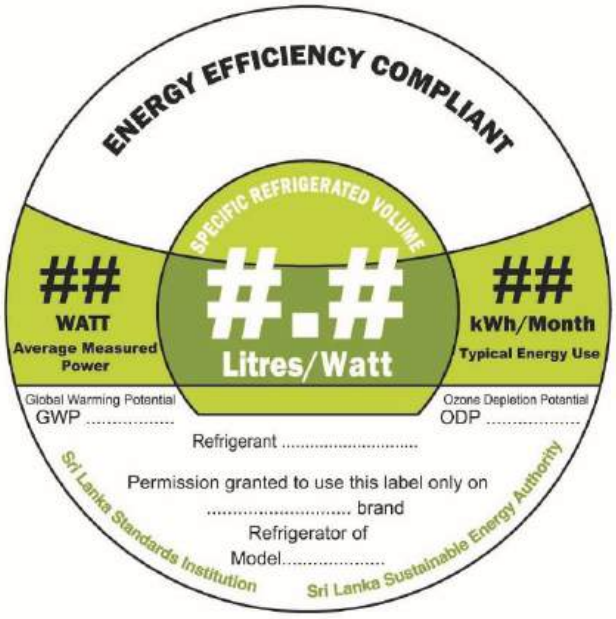


Figure 1: Minimum Energy Performance Label for Refrigerators

The measurements of electricity consumption in refrigerators, conducted by SLSEA and vendors, give the following average values as per Table 1.

Table 1: Electricity consumption in refrigerators

Type of Refrigerator	Value (kWh/month)
Single-door refrigerator	25
Double-door refrigerator	30

Literature Review

The energy consumption of domestic refrigerators has been an area of consideration for many academic and industrial research since refrigerators are widely used in homes across the world. Department of Census and Statistics of Sri Lanka has given that out of 5,752,707 households in Sri Lanka, the refrigerator penetration is 3,126,252 (54.34%) (Department of Census and Statistics, 2024). Borikar et al. (2021) in an experimental study demonstrated that ambient temperature and heat load significantly affect energy consumption and the Coefficient of Performance (CoP) of refrigerators, with statistical analysis via Box-Behnken Design (BBD) yielding accurate model fits (R2 = 0.995). Geppert & Stamminger (2013) examined the effects of operational factors under real-life conditions contributing to refrigerator energy consumption and questioned the accuracy of energy labels in predicting actual consumption in real-life situations. Further studies explored the impact of energy efficiency labels on purchase decisions (d'Adda et. al., 2022) while some studies discussed the optimisation of home appliance usage in the context of financial constraints and device obsolescence (Karagiannopoulos et al., 2024). A recent study revealed the potential for energy and financial savings when consumers are provided with information and motivation to alter their energy usage patterns (Ramnath et al., 2024). This study also takes a similar approach to assessing the national impact of phasing out of the inefficient refrigerator fleet in the Western Province, Sri Lanka.

Methodology

SLSEA has analysed the details of 251 homes in the Western Province to find out the energy consumption patterns of the households. The selection was based on the willingness to monitor their

energy consumption for a continuous seven-day period using plugged-in power meters. Data on monthly electricity bills, refrigerator's age and type, consumption for the refrigerator, and thermostat settings were checked mainly, with few other observations. If the consumer has purchased a new refrigerator after the monitoring of energy consumption, the new consumption was also measured and bill values were observed. The collected dataset was analysed using spreadsheet applications.

Figure 2: Power meters in use

A working model has been developed with spreadsheets to assess the viability of purchasing MEP-labelled refrigerators in four different financial solutions that can be arranged by individuals or through lending institutes.

The energy consumption patterns of the households are given in Table 2. It is noteworthy that the share of refrigerators in a household energy balance has decreased from 52% in 2010 to 35.50%, largely due to the addition of new appliances such as geyzers, air-conditioners, electric cookstoves, rice cookers, CCTVs, laptops, washing machines, water filters, phone chargers, etc. Therefore, the share of the refrigerator in a typical household energy balance has decreased over time.

Table 2. Geographical spread of the consumers being surveyed

District	No. of Households Being Surveyed	Average Electricity Bill of the Respective District (kWh/month)	Average Electricity Consumption for the Refrigerator (kWh/month)	Energy Balance for the District
Colombo	138	166.52	54.76	32.88%
Gampaha	86	142.35	54.91	38.58%
Kalutara	27	137.49	57.14	41.56%
Total	251	155.11	55.07	35.50%

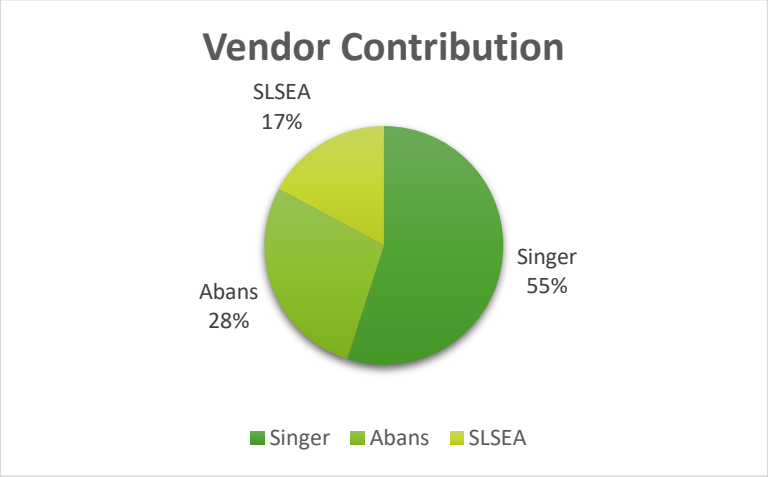


Figure 3: Vendor Contribution to the Survey

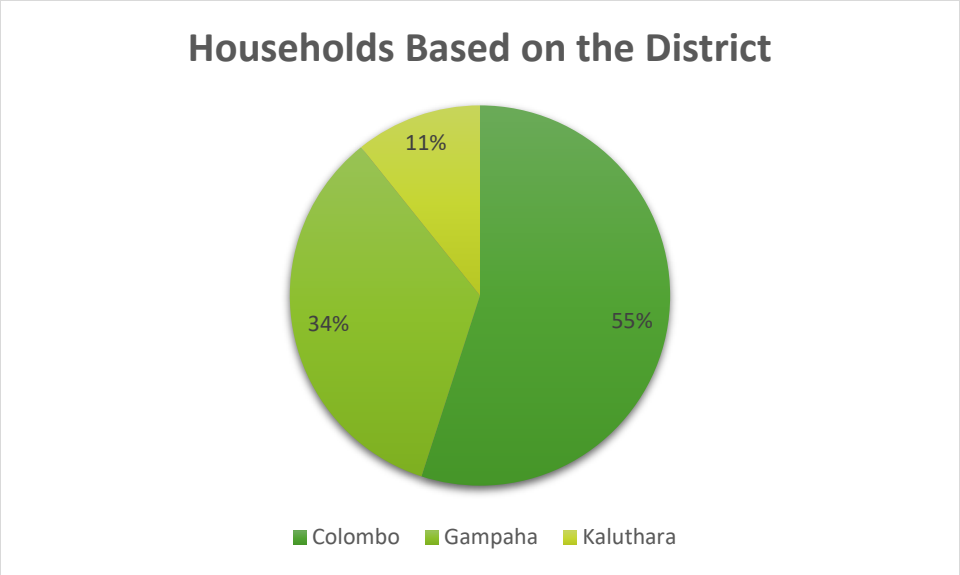


Figure 4: Households based on the District

Considering the volume of refrigerators used in households, 43.03% of refrigerators are below 200 L capacity whereas 56.97% are above 200 L capacity. Few exceptions are available in both high-end and low-end volumes.

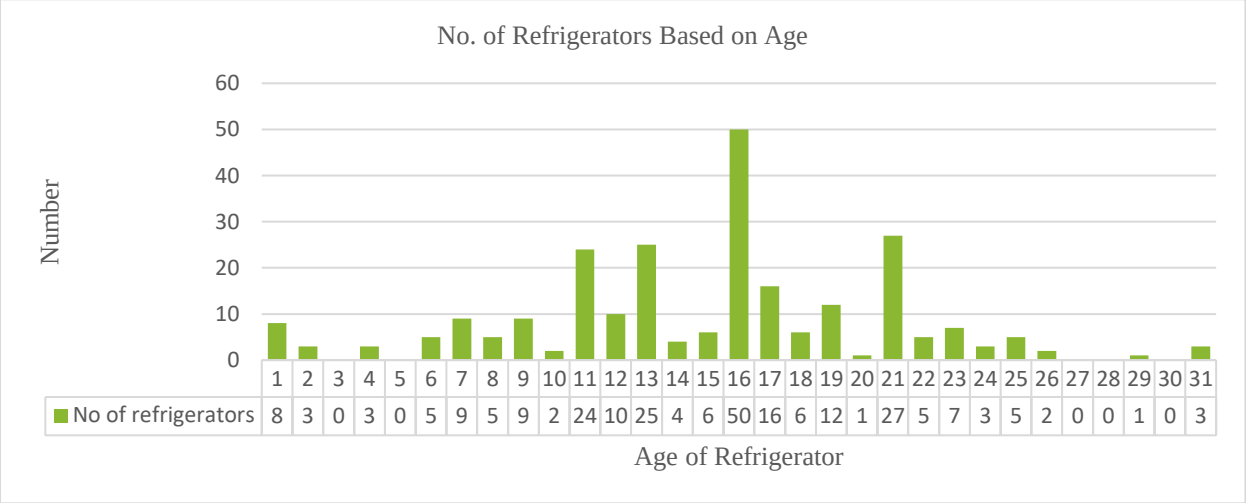
Volume	Number	Percentage
85 L - 132 L Single Door	4	1.59%
165/172/173/176/180 L Single Door	17	6.77%
190 L/193 L/200 L	87	34.66%
220 L/230 L/237 L/250 L/266 L	129	51.39%
Above 280 L	14	5.58%
Total	**251**	**100%**

Figure 5: Volume of refrigerators in use

Results and Discussion

Refrigerator Age Analysis

Considering Figure 6, a significant portion of the refrigerator fleet is above 10 years old (57.08%). A parallel analysis between age vs. consumption (Figure 5) reveals a positive correlation between the variables of consumption and the refrigerators' age demonstrating that the older refrigerators consuming a substantial amount of energy. Furthermore, the older models had high global warming/ozone-depleting refrigerants such as R-134a and R22. After 2014 the two local refrigerator manufacturers shifted towards more energy efficient technologies and using environmentally sustainable refrigerants such as R-600a having a lower global warming potential and ozone depleting potential (Sumathipala, 2015). In the last decade, many global manufacturers have evolved with new technologies such as inverter technology, smart monitoring, eco-friendly refrigerants and better-quality materials. Due to this reason, the modern refrigerators require less energy than the older-generation refrigerators.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
No of refrigerators	8	3	0	3	0	5	9	5	9	2	24	10	25	4	6	50	16	6	12	1	27	5	7	3	5	2	0	0	1	0	3

Figure 6: Number of refrigerators based on age

The age vs. the average consumption of the refrigerator had a correlation as Figure 6.

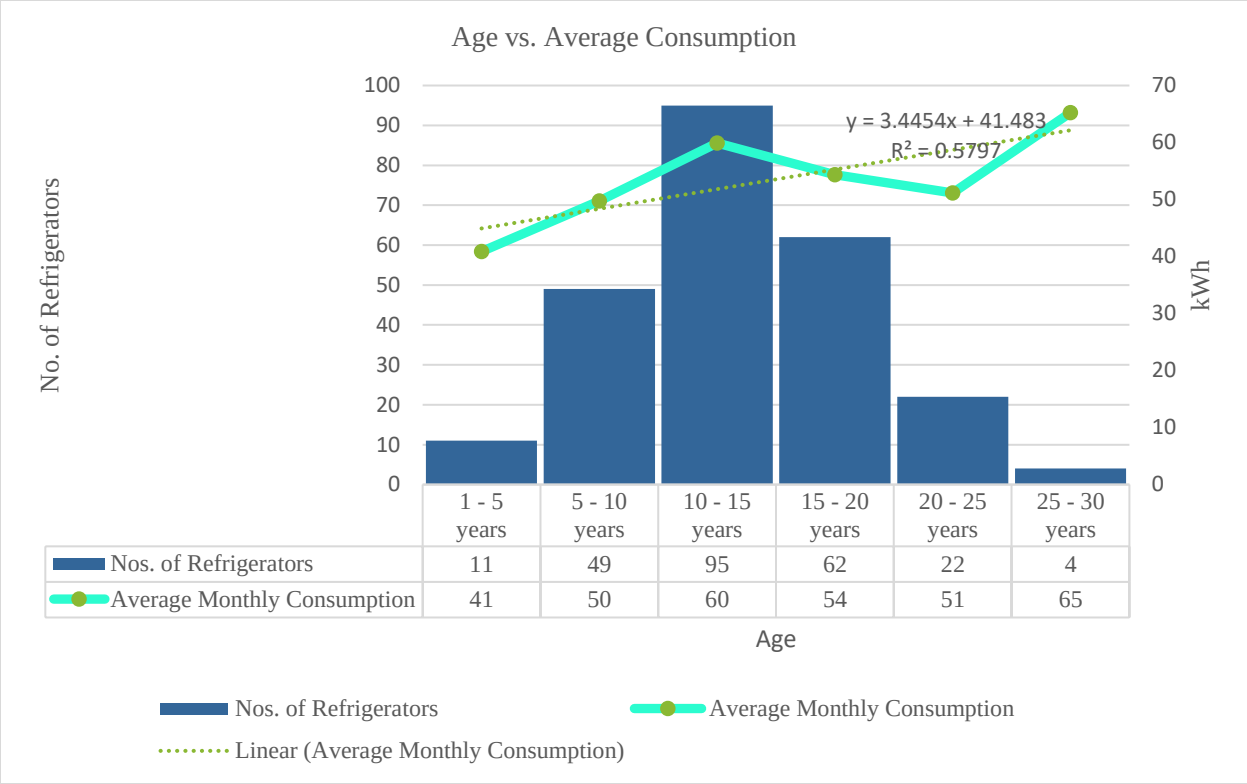


Figure 7: Age vs. average consumption

Consumption Analysis

With the above data, the following calculations are done.

Average electricity consumption of the household per month is taken from bill values. Then the consumption for the refrigerator alone is taken from the plug-in power meter, and average units for 30 days are calculated for the refrigerator alone. From the available data of energy labelled refrigerators, it is taken that a single-door refrigerator consumes 25 units and a double-door refrigerator consumes 30 units per month. Therefore, the following observations are made. Dynamic models were made in the analysis that will enable to change input values and see the results.

- Suggested saving per month
- Old bill value in LKR
- New reading
- New bill value in LKR

- Monetary savings per month for the consumer
- Payback years based on four different prices offered by vendors.
- The decision to change the refrigerator or not.
- Relationship of the age of the refrigerator vs. the decision to change.

The total number of double door refrigerators were 147, and number of single-door refrigerators are 103. As a rule of thumb, we found that if the monthly saving is more than LKR 1500, payback periods of less than 7 years can be expected. In simple terms, the capital investment required to purchase a new refrigerator will be recovered from the reduction in the household electricity bills within 7 years. If the consumption for the old double door refrigerator is more than 70 units, definitely the refrigerator should be replaced. The higher the consumption, the lower the pay-back period becomes. In the case of single-door refrigerators, if a refrigerator consumes more than 60 electricity units per month, it is advised to change the refrigerator immediately, since the payback is before 7 years. Therefore, relevant households were notified of the viability of replacing refrigerators.

The single-door models and the double-door models were analysed separately and were visualised through boxplot diagrammes to highlight the range and the distribution of electricity consumption values. Extremely high values were noted in both cases, indicating that the refrigerator is the main culprit of the high energy bills of certain homes. Additionally, each data point was visualised in ascending order in comparison with a MEP-labelled refrigerator's consumption value.

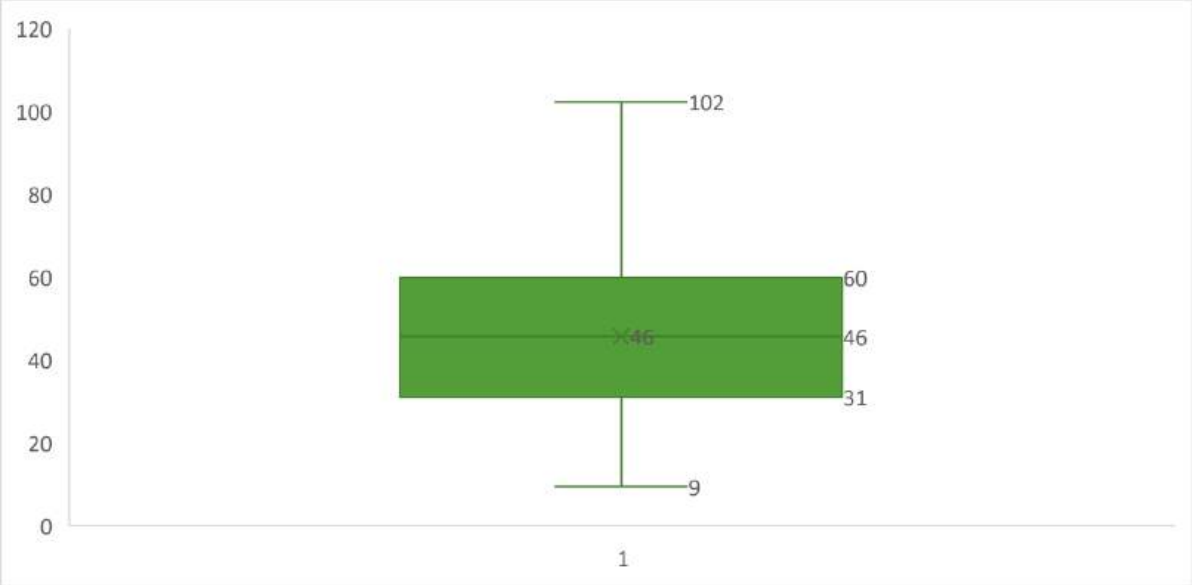
The following tests were conducted for single door refrigerators and double door refrigerators in Excel data analysis tool packs and the results are given herein.

Single Door Refrigerators

Figure 8: Analysis of Single Door Refrigerators (Distribution of the Consumption)

Sample size	103
Average age of refrigerator	13.93
Average bill of the households	142.77
Average consumption of the single door refrigerator	45.66

Percentage of energy used for the single door refrigerator	32%
Minimum consumption	9.39
Maximum consumption	102.26



Average Light Bill (kWh)		*Consumption of the Refrigerator for the Month (kWh)*		*Age of Old Refrigerator (Years)*	
Mean	142.77	Mean	45.66	Mean	13.93
Standard Error	7.19	Standard Error	1.83	Standard Error	0.59
Median	128.00	Median	45.62	Median	15.00
Mode	122.00	Mode	#N/A	Mode	15.00
Standard Deviation	72.92	Standard Deviation	18.53	Standard Deviation	6.02
Sample Variance	5318	Sample Variance	343.3	Sample Variance	36.18
Kurtosis	20.07	Kurtosis	-0.30	Kurtosis	0.20
Skewness	3.81	Skewness	0.31	Skewness	-0.03
Range	532.00	Range	92.87	Range	30.00
Minimum	61.00	Minimum	9.39	Minimum	0.00
Maximum	593.00	Maximum	102.3	Maximum	30.00
Sum	14705	Sum	4703	Sum	1435
Count	103	Count	103	Count	103
Confidence Level (95.0%)	14.25	Confidence Level (95.0%)	3.62	Confidence Level (95.0%)	1.18

Descriptive statistics provide valuable insights into the energy consumption patterns and age distribution of single-door refrigerators included in the survey. Average light bill is 142.77 kWh, but the data shows high variability with some units consuming significantly more energy, indicated by a high standard deviation and positive skewness. Monthly consumption of single door refrigerators averages at 45.66 kWh, with a fairly normal distribution, showing consistency among most units. Additionally, the average age of these refrigerators is 13.93 years, with a wide age range up to 30 years. This analysis suggests that many older refrigerators are likely contributing to increased energy consumption. The positive skew in light bill data and the significant age range indicate a potential for energy savings through the targeted replacement of older, less efficient units.

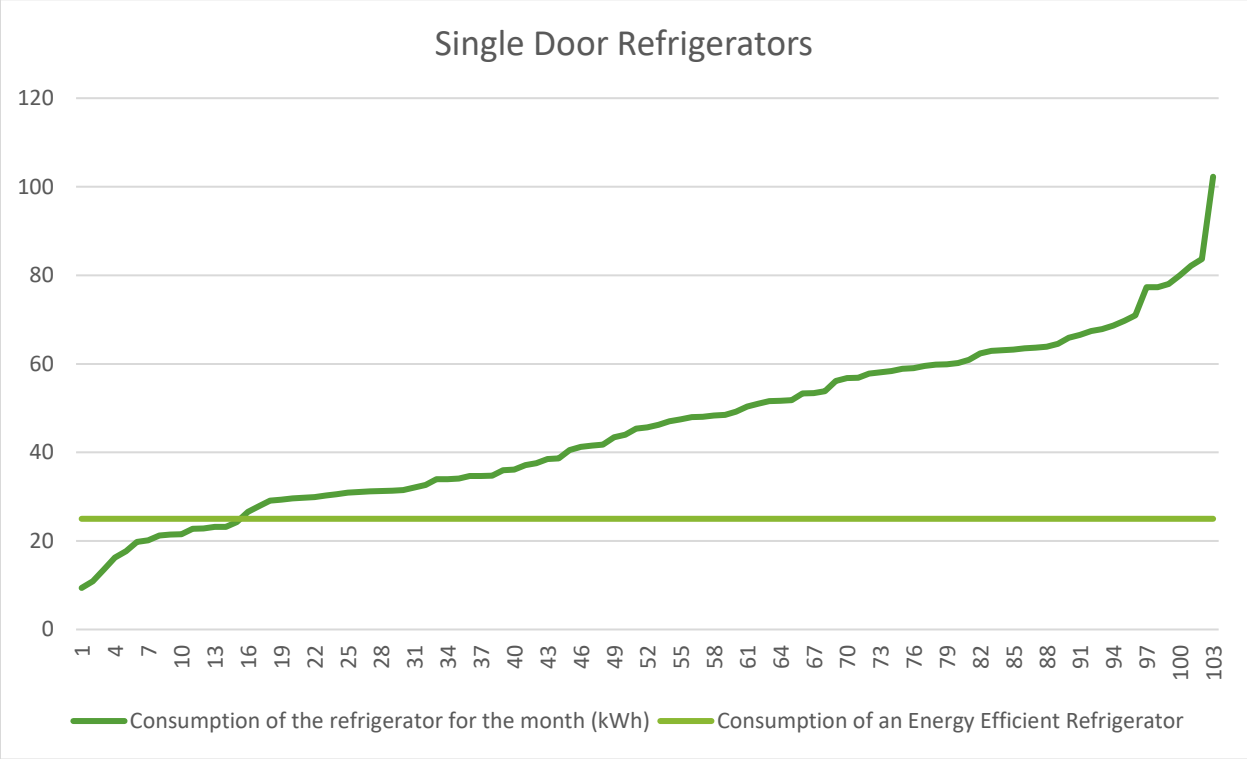
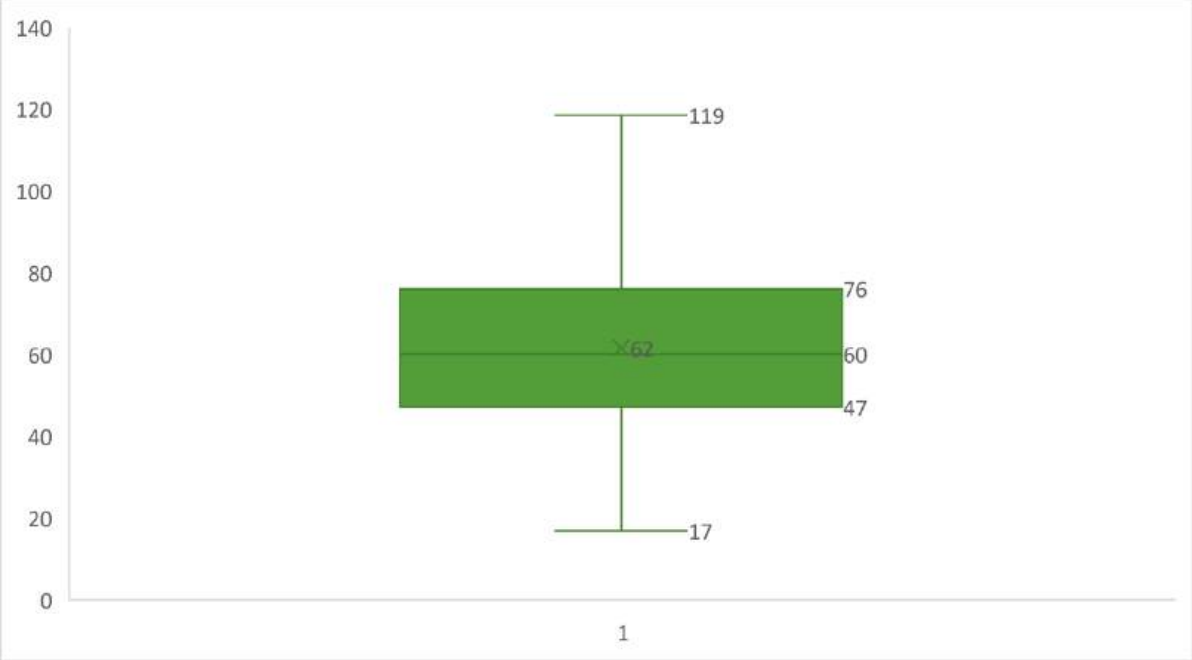


Figure 9: Analysis of Single Door Refrigerators

Double Door Refrigerators

Figure 10: Analysis of Double Door Refrigerators (Distribution of the Consumption)

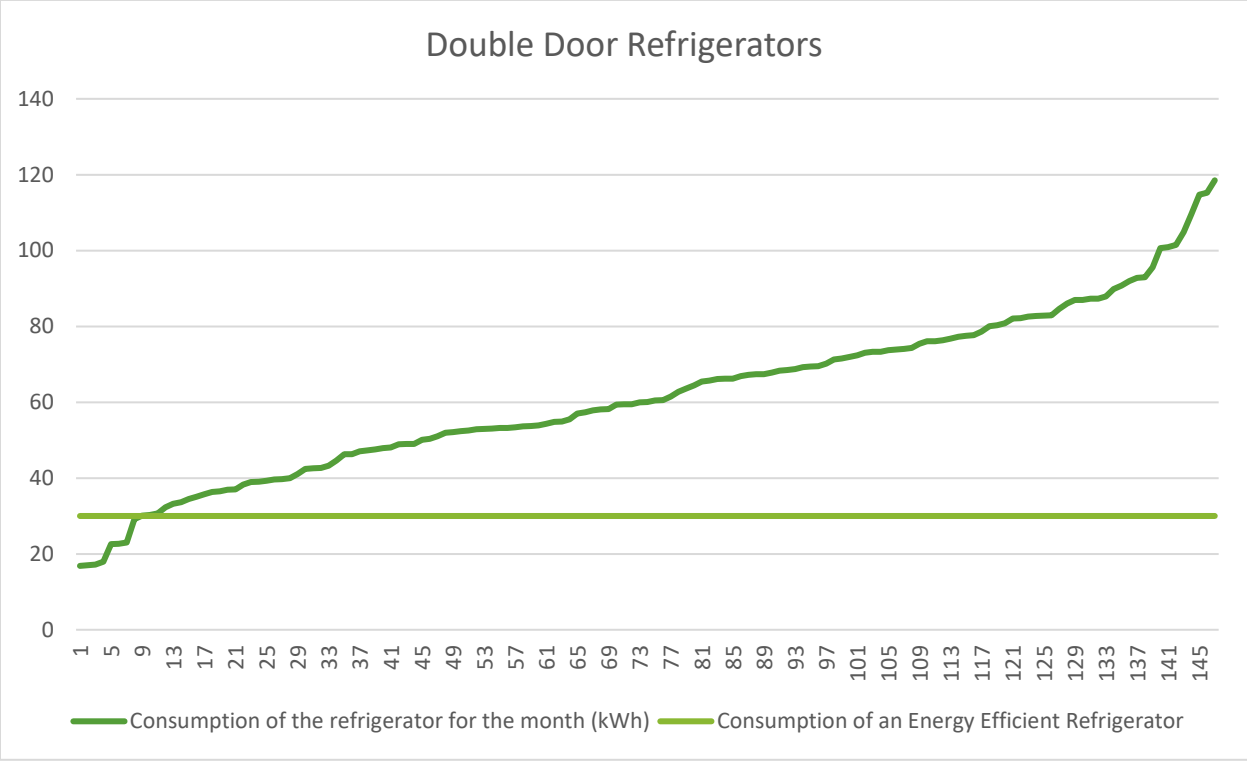
Sample size	147.00
Average age of refrigerator	13.95
Average bill of the households	163.46
Average Consumption of the Double Door Refrigerator	61.53
Minimum consumption	16.85
Maximum consumption	118.52



Average Light Bill (kWh)		*Consumption of the refrigerator for the month (kWh)*		*Age of Old Refrigerator (Years)*	
Mean	163.46	Mean	61.53	Mean	13.95
Standard Error	6.99	Standard Error	1.78	Standard Error	0.48
Median	138.00	Median	60.09	Median	15.00
Mode	121.00	Mode	#N/A	Mode	15.00
Standard Deviation	84.81	Standard Deviation	21.64	Standard Deviation	5.81
Sample Variance	7192	Sample Variance	468	Sample Variance	33.72
Kurtosis	14.02	Kurtosis	-0.21	Kurtosis	0.31

Skewness	2.78	Skewness	0.20	Skewness	-0.26
Range	681	Range	101.67	Range	30
Minimum	53.00	Minimum	16.85	Minimum	0.00
Maximum	734	Maximum	118.52	Maximum	30.00
Sum	24028	Sum	9045	Sum	2051
Count	147	Count	147	Count	147
Confidence Level (95.0%)	13.82	Confidence Level (95.0%)	3.53	Confidence Level (95.0%)	0.95

Figure 11: Analysis of Double Door Refrigerators



Consumption and Monetary Saving Analysis Based on Tariff Category

Overview of the Tariff System

The Sri Lankan electricity tariff structure is based on a block-wise system, where consumers are charged differently depending on their electricity consumption. The aim of this structure is to encourage energy conservation, particularly among high-end consumers, by offering subsidised rates to lower-end consumers and progressively higher rates as consumption increases. The tariff structure at the time of the survey, effective from March 5, 2024, features sharp increases in the bills once a certain consumption threshold is exceeded. These thresholds are set at 60, 90, 120, and 180 kWh.

Table 3. Tariff Category

Monthly Consumption (kWh)	Unit charge (LKR/kWh)	Fixed charge (LKR/month)
0-60	25	-
61-90	30	400
91-120	50	1,000
121-180	50	1,500
>180	75	2,000

At the time of survey, 1 USD was equal to 310 LKR.

As a result of this tiered system, consumers who exceed certain consumption thresholds experience sharp increases in their electricity bills, which can be financially burdensome.

Refrigerator Consumption Analysis

The data indicates that refrigerators are a significant part of household energy consumption, especially among high consumers of electricity. The analysis was conducted on two types of refrigerators: single-door and double-door. Here is a summary of the average monthly consumption for refrigerators and the associated potential savings from switching to energy-efficient models, particularly when an existing unit is over 10 years old.

It is observed that in case of exceeding 91 units, especially if the existing unit is more than 10 years old, there is an opportunity to consider switching to a new refrigerator.

The survey also helped identify poor housekeeping practices and maintenance practices. Improper sealing of refrigerator doors, improper thermostat settings, and over-packing of refrigerator compartments all contribute to excessive costs. What's more, some refrigerators had only a small amount of empty items.

Analysis of Refrigerators Based on the Tariff

Table 4. Savings achievable based on the tariff category.

01. Single Door Refrigerator

Tariff Category	No of Single Door Refrigerators	Average age of Single Door Refrigerators	Average energy bill as an integer in Single Door Users	Average Consumption for the Refrigerator in Single Door Refrigerators (kWh)	Saving SD in kWh	New Energy Consumption in SD	Old Bill IN SD	New Bill in SD	Saving in LKR to check Viability in Single Door
0-60	0	0	0	0	0	0	154	154	-
61-90	18	12.88	81	38	13	68	2,593	2,194	400
91-120	21	11.76	107	48	23	84	4,356	2,686	1,671
121-180	47	15.53	142	46	21	**120**	6,663	5,023	1,640
>180	17	13.29	254	50	25	229	14,811	12,889	1,922

02. Double Door Refrigerators

Tariff Category	No of Double Door Refrigerators	Average age of Double Door Refrigerators	Average energy bill as an integer in Double Door Users	Average Consumption for the Refrigerator DD (kWh)	Saving DD in kWh	New Energy Consumption in DD	Old Bill in DD	New Bill in DD	Saving in LKR to check Viability in Double Door
0-60	2	13	**56**	49	**19**	37	1,087	697	390
61-90	13	15.54	**81**	51	**21**	60	2,593	1,169	**1,425**
91-120	33	13.78	**106**	52	**22**	84	4,305	2,686	1,620
121-180	52	13.36	**146**	64	**34**	112	6,868	4,613	2,255
>180	48	14.33	**252**	68	**38**	214	14,658	11,736	2,921

Financial and Sensitivity Analysis

NPV, IRR and Payback Analysis

Below is a functional model to evaluate the feasibility of refrigeration switching in four different financial solutions.

01.Total cost paid upfront and disposal cost after 12 years.
02.Bank credit card use with 24-month installment plan with zero interest.
03.Taking a personal loan from a bank and pay monthly interest+ principal.
04. Utility lead programme to replace refrigerators with long term repayment and concessionary rate.

Table 5. Input parameters for a case of refrigerators

1	Annual consumption of the inefficient refrigerator	624	kWh/year
2	Electricity saving of the Year 1	19,434	LKR
3	Capital cost of a refrigerator	78,945	LKR
4	Increase of electricity bill (5th year)	125.00%	
5	Increase of electricity bill (8th year)	130.00%	
6	Disposal cost after 12th year	(8,000)	LKR
7	Bank interest rate for (personal) loans	12.00%	
8	Bank loan repayment period	7	years
9	Discount rate used for the analysis	8.00%	
10	Concessionary financing rate	4.00%	
11	Utility loan repayment period	8	years
12	Annual increase in consumption	12	kWh

Table 6: Example of a Results Matrix

	Solution 1	Solution 2	Solution 3	Solution 4
Discounted Payback (years)	4.54	4.32	4.21	
NPV after discounting (LKR)	117,777	122,407	93,889	119,422
IRR %	27%	33%		

The analysis highlights that for lower electricity consumption categories (91-120 kWh/month), the payback period for refrigerator replacement programs varies between 6.85 years and 8.88 years, depending on the solution implemented. In contrast, bulk electricity consumers using over 180 kWh/month see much shorter payback periods, ranging from 2.91 to 3.09 years. Notably, scenarios with an asterisk in Table 6 reveal that the net present value (NPV) of utility-led initiatives can range from LKR 47,200 to LKR 193,481, assuming a 4% interest rate and an 8-year repayment period. This demonstrates the potential of concessionary financing as an effective tool to encourage refrigerator replacements, particularly for units older than 10 years and households consuming more than 90 kWh/month, making the transition more financially viable.

The working model provides a comprehensive framework for evaluating key financial metrics such as payback periods, net present value (NPV), and internal rate of return (IRR) under various conditions. It considers factors like the annual energy consumption of inefficient refrigerators, the capital cost of replacements, rising electricity bills, disposal expenses, increased energy usage from degradation, and financial variables like the Average Weighted Prime Lending Rate (AWPR), loan terms, concessionary financing rates, and repayment periods in utility-led programs. By allowing these variables to be adjusted, the model enables users to assess different scenarios and make informed decisions about whether to proceed with a purchase and which solution to choose. This tool is beneficial not only for end-users but also for policymakers, as it supports data-driven decisions on energy-efficient appliance adoption.

Sri Lanka's Operation Demand Side Management Programme (ODSM) aimed to phase out inefficient refrigerators, which traditionally accounted for approximately 50% of household energy bills. Although the contribution of refrigerators to domestic energy consumption has decreased over time, replacing outdated units still offers substantial opportunities for energy and monetary savings, alongside environmental benefits. The program initially targeted a reduction of 161 GWh from the national grid, beginning with a pilot study as the first phase. The outcomes of this pilot study provide valuable insights

into the feasibility and impact of large-scale refrigerator replacement efforts, showcasing the potential for significant efficiency improvements and sustainable energy use.

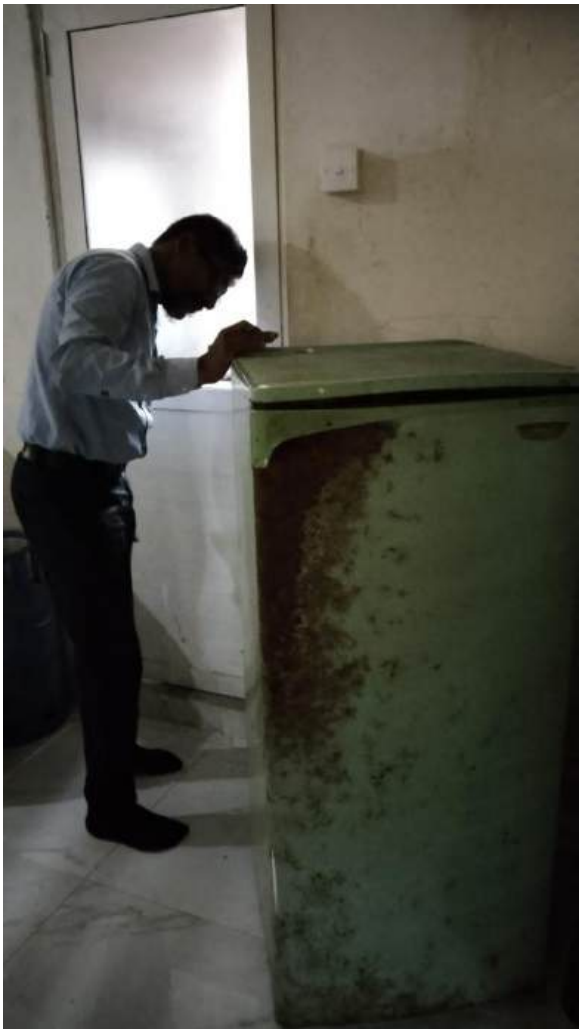
Table 7: Impact of a Western Province Programme

Description	Amount
Total Households in Western Province	1,651,027
Total Refrigerators in Western Province	1,114,549
Percentage of houses having Refrigerators	68%
Savings Achievable from Switching a Single Door Refrigerator Above 10 Years (kWh/month)	24
Savings Achievable from Switching a Double Door Refrigerator Above 10 Years (kWh/month)	33
No. of Households Using above 91 kWh as a Percentage	24%
No. of Households with Refrigerators Above Ten Years - Single Door	72%
No. of Households with Refrigerators Above Ten Years - Double Door	74%
Number of Refrigerators to be Changed due to Inefficiency - Single Door	79,476
Number of Refrigerators to be Changed due to Inefficiency- Double Door	117,433
Savings Achievable in Single Door if all Refrigerators are Changed (MWh/year)	22,605
Savings Achievable in Double Door if all Refrigerators are Changed (MWh/year)	46,180
For a Provincial Programme, where 1% of the Inefficient Fleet is Changed (2,000 nos. approximately)	
Total Savings Achievable (MWh/year)	687.85
Carbon Savings Achievable (MT-CO_2 Eq/year) ref- energy balance 2021	478
Monetary Savings Achievable (USD/annum) based on Utility Point of View ref- CEB Stat Digest 2023	86,000
Capital Required for Replacement of 2,000 Refrigerators (USD) based on Individual Point of View	725,845

Following the completion of the pilot study in the Western Province, adjustments to the original strategy for phasing out inefficient refrigerators have become necessary. The post-COVID-19 foreign exchange crisis eliminated access to long-term soft loan schemes, causing refrigerator sales to plummet

to one-third of their original volumes. Despite the significant potential impact on the national grid, trade-in programs and soft financing remain unattractive without key measures. These include increasing public awareness through mass media, securing vendor participation, promoting purchase decisions based on life-cycle cost analysis, popularising Minimum Energy Performance (MEP) labeling, ensuring proper disposal of old refrigerators, addressing emotional attachments to long-used appliances, enabling equipment-specific consumption monitoring, offering utility-driven payback schemes, and establishing effective monitoring protocols. Addressing these challenges is essential to making replacement programs both appealing and effective.

Figure 12: Inspecting a house



It was decided that changing a refrigerator is feasible for a monthly monetary saving of more than LKR 1,500 per month. Initially, the data analysis was done on payback periods but the vendors have pointed out that the people are more biased to take decisions based on savings. Therefore, monetary saving was considered in final data analysis.

Table 8:

Category	Do not change the refrigerator	Change the refrigerator		Total	Percentage of refrigerators that need to be changed
	Less than 1500	1500-3500	Above 3500		
Less than 60	0	0	0	0	0%
61-90	14	4	0	18	22%
91-120	12	7	2	21	43%
121-180	23	22	2	47	51%
Above 180	6	10	1	17	65%
	55	43	5	103	47%

Therefore, in the houses being surveyed, we found a high potential for energy saving and electricity bill reduction. This was especially the case in houses with refrigerators of more than ten years. In the last decade, many manufacturers have evolved with new technologies such as inverter technology, smart monitoring, eco-friendly refrigerants and better-quality materials. Due to this reason, the modern refrigerators require less energy than the older-generation refrigerators.

	Change	Don't change	Total
More than 10 years	38	34	72
Less than 10 years	8	21	29
Total	46	55	101

Apart from a few families that use air conditioners, the main culprit of the cost of electricity is the refrigerator.

In the total sample of 145 double-door refrigerators, 90 of them needed replacement due to high energy consumption, which is 62% of the sample. In the total sample of 103 single-door refrigerators, 48 of them needed replacement, amounting to 47% of the sample. Therefore, the most problem is available in double-door refrigerators.

Table 9:

Category	Do not change the refrigerator	Change the refrigerator		Total	Percentage of refrigerators that need to be changed
	Less than 1500	1500-3500	Above 3500		
Less than 60	2	0	0	2	0%
61-90	7	6	0	13	46%
91-120	21	10	2	33	36%
121-180	16	25	11	52	69%
Above 180	9	19	17	45	80%
	55	60	30	145	62%

	Change	Don’t change	Total
More than 10 years	18	20	38
Less than 10 years	37	72	109
Total	55	92	147

Observations on poor housekeeping and maintenance

Many instances were seen in poor housekeeping, issues of sealing of doors, inappropriate setting of thermostats and excessive packing inside refrigerators. We also seen instances where only a few items being kept in the refrigerators, giving doubts whether having a refrigerator is necessary.

Apart from the survey, SLSEA was able to publish knowledge sharing articles in National Newspapers of Daily Mirror and Sirikatha sharing knowledge of the programme. It is highly important that we involve the general public as much in sharing the research outcomes.

Recommendations:

- To educate the public more on the programme and get their willingness to do the survey
- To encourage vendors to offer trade in schemes
- Proper reporting of the progress through mass media.
- Need more commitment from vendors
- Vendors need to develop a strategy to link with area sales network to collect data
- Vendors should focus more on disposal of old refrigerators for sustainability
- Vendors need to have proper coordination within the organisation on outlet level sales.
- Due to current economic situation of the country, most of the middle-class families can't afford to invest on such high investment, therefore it is needed to develop some financial mechanism to support them

Annex 1: Issued Certificates for Minimum Energy Performance – Refrigerators

S. No	Certificate No	Company Name	Brand Name	Model Name	Litres/ Watt	Date of Issue
1.	0001	D R Home Appliances	INNOVEX	DDR 195	4.0	2022/06/06
2.	0002	D R Home Appliances	INNOVEX	DDN 240	3.8	2022/06/06
3.	0003	D R Home Appliances	ABANS	ALG-200DD	4.1	2022/06/06
4.	0004	D R Home Appliances	ABANS	ALG-252NF	4.2	2022/06/06
5.	0005	LG Electronics India	LG	GL-K272SLBB	7.3	2022/06/06
6.	0006	Regnis Lanka PLC	SISIL	ECO 192	3.9	2022/06/06
7.	0007	Regnis Lanka PLC	SISIL	ECO 192WR	3.9	2022/06/06
8.	0008	Regnis Lanka PLC	SISIL	ECO 192WR-R	3.9	2022/06/06
9.	0009	Regnis Lanka PLC	SISIL	ECO 192WR-BG	3.9	2022/06/06
10.	0010	Regnis Lanka PLC	SISIL	ECO 192-CV	3.9	2022/06/06
11.	0011	Regnis Lanka PLC	SISIL	ECO 192WR-SV	3.9	2022/06/06
12.	0012	Regnis Lanka PLC	SISIL	SL-ECO 192WR BU	3.9	2022/06/06
13.	0013	Regnis Lanka PLC	SISIL	ECO 251 NF	3.8	2022/06/06
14.	0014	Regnis Lanka PLC	SISIL	ECO 251 NF-SV	3.8	2022/06/06
15.	0015	D R Home Appliances	DAMRO	DRDD 195	4.0	2023/02/15
16.	0016	D R Home Appliances	INNOVEX	IDR 180 S	4.4	2023/07/01
17.	0017	Abans PLC	ABANS	ABLGPRO-205DD	4.4	2023/07/07
18.	0018	D R Home Appliances	DAMRO	DRDS 180	4.4	2023/07/01

Annex 2: A sample of a filled questionnaire

077 [redacted]

Energy Efficient Refrigerator Programme Data Collection Form

Form No: 69 SLSEA Officer Name: Sasanka, Shachini (2)

1. Name of the customer [redacted] Dias
2. Address: [redacted] 2c Alwis Place Dehiwala.
3. District: [✓] Colombo [ ] Gampaha [ ] Kaluthara
4. Vendor Name: [ ] Abans [ ] Damro [ ] Singer

		Old Refrigerator	New Refrigerator
5.	Brand	LG	
6.	Model	GR-282MBF	
7.	Capacity	[ ] 190L [✓] 250L [ ] Other.....L	[ ] 190L [ ] 250L [ ] Other.....L
8.	Serial Number	103KR00011	
9.	Power	Actual 160 W Rated 165	.....W

10. Age of old refrigerator: 15 Years
11. CEB/LECO Account Number: 389 [redacted] 14

		Month 1	Month 2	Month 3	Average
12.	Monthly electricity usage before replacement of old refrigerator	259 kWh/Month	253 kWh/Month	225 kWh/Month	..... kWh/Month
13.	Monthly electricity usage after replacement of old refrigerator	..... kWh/Month	..... kWh/Month	..... kWh/Month	..... kWh/Month

Power cord - 1 ✓
multy socket - 1 ✓

https://docs.google.com/document/d/1WNjpt93KaMyRuw0RwYJONbMm87L4obSS/edit 1/2

		Old Refrigerator	New Refrigerator
14.	Reference No of the plug in Power meter	PM 18	
15.	Date and time of plug in power meter installed	12.00 pm DD/MM/YY 01/07/23	DD/MM/YY
16.	Electricity usage for 7 days	28.02 kWh	.....kWh
17.	Date and time plug in power meter removed	9/07/23 15.25	DD/MM/YY
18.	Thermostat setting middle		

Note: Measure 7 days electricity usage

19. Comments from the customer:

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.....

.....

[redacted] Signature of the customer

[redacted] Signature of the SLSEA officer (1)

[redacted] Signature of the SLSEA officer (2)