November 2026

Institute for Energy Economics and Financial Analysis

Household space cooling in Bangladesh: Role of energy-efficient fans

Information gaps and high upfront costs hold back adoption

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Contents

Key findings 4
Executive summary 5
Background 8
Rationale for household space cooling efficiency 8
Stress on power grid from rising demand 8
Grid power consumption pattern 11
Seasonal variation in power demand 11
Power demand trends of household cooling fans 12
Survey design 13
Selection of income group 13
Sample size 15
Survey results 15
Fan ownership and usage 15
Operating periods 17
Share of energy-efficient fans in households 18
Consumer willingness to switch to energy-efficient fans 18
Requirement for consumer support 19
Power and energy demands led by fans 20
Estimating power- and energy-saving potential 21
Feasibility assessment 24
Supporting instruments 25
Bulk procurement and carbon revenue 26
The case for a super ESCO 27
Way forward 28
Annexure 1: Questionnaire 30
Annexure 2: Sample size calculation 31
Annexure 3: Calculation of household power and energy demand due to fans 32
Annexure 4: Calculation of power- and energy-saving potential 34
Annexure 5: Payback period calculation 36
About IEEFA 37
About the author 37

Acknowledgements 37

Figures and tables

Figure 1: Summer power demand and loadshedding trend 9
Figure 2: Sectoral grid-power consumption trend (GWh) 11
Figure 3: Selected load curves of summer and winter days (MW) 12
Figure 4: Sectoral power demand (segregated household data shows demand from various appliances), 31 May 2014 12
Figure 5: Energy demand of different household appliances, FY2013-14 13
Figure 6: Household income distribution 14
Figure 7: Representation of households in the survey 15
Figure 8: Fan ownership and summer usage across household income groups 16
Figure 9: Average fan operating hours by household income groups 17
Figure 10: Share of energy-efficient fans 18
Figure 11: Willingness to shift to energy-efficient fans 18
Figure 12: Households' views on financial support for energy-efficient fans 19
Figure 13: Power-saving potential by replacing energy-inefficient fans 22
Figure 14: Energy consumption by different appliances in 2030 (FY2013-14 projection) 23
Figure 15: Power demand of different sectors (segregated household data shows power demand of different appliances) in 2030 (FY2013-14 projection) 23
Figure 16: Average monthly electricity bills during summer 25
Figure 17: Payback period of investment in energy-efficient fans 25
Figure 18: Payback period of investment in energy-efficient fans under support measures 26
Figure 19: Implementation framework of household programme on energy-efficient fans 28
Table 1: Estimated distribution of households according to monthly income, 2026 14
Table 2: Estimated power demand due to household fans 20
Table 3: Estimated energy demand due to household fans 20

Key findings

Household fans for space cooling alone account for up to 5,212 megawatts (MW) of Bangladesh's summer power demand. Yet energy-efficient Brushless Direct Current (BLDC) fans make up less than 2% of household fans.

Replacing energy-inefficient household fans with BLDC fans could cut summer power demand by up to 2,590MW and avoid over USD4 billion in future investment in coal-fired plants. It could also save 6,913 gigawatt-hours (GWh) of electricity a year, worth BDT89.87 billion (USD0.73 billion).

Households lack information on the availability of BLDC fans and their energy-saving potential. In addition to raising awareness, the Sustainable and Renewable Energy Development Authority (SREDA) should finalise standards and labels for fans to nudge consumers towards efficient models.

The government could design a national programme to cut the upfront cost of BLDC fans through bulk procurement and recycle the programme's carbon revenue to make them affordable for low-income households.



Executive summary

The household sector is the biggest driver of Bangladesh's grid-based power demand, and space cooling through fans and air conditioners makes up a significant share of it. According to the country's Energy Efficiency and Conservation Master Plan, daily power demand for household fans accounted for around 1,000 megawatts (MW) against the peak demand of over 6,000MW in May 2014. Further, fan-led energy consumption stood at 6,181 gigawatt-hours (GWh) in fiscal year (FY) 2013-14 against 17,570GWh consumed by all household appliances.

As the country stepped up efforts for 100% electrification and global mean temperature increased, household space cooling demand surged too, adding to utilities' stress to ramp up power generation. Despite the current installed capacity of 29,143MW, the country finds it challenging to meet power demand when it crosses 16,000MW, resulting in loadshedding of more than 3,000MW.

Against this background, this study surveys 435 households in 26 of the country's 64 districts, selected through predefined income levels. It identifies fan-usage patterns among different income groups.[1] The survey reveals that less than 2% of the households use energy-efficient Brushless Direct Current (BLDC) fans that are of 35 watts (W), as opposed to energy-inefficient fans of 70W.

The study estimates that the power demand from household space cooling, led by fans, ranges from 3,362MW to 5,212MW, with maximum demand occurring in the evening. Further, it quantifies the annual energy consumption from fans at 13,916GWh, consistent with the draft Bangladesh National Cooling Plan's projection of 22,174GWh in 2035.

Replacing the vast stock of Bangladesh's energy-inefficient fans with BLDC fans could reduce power demand by up to 2,590MW, avoiding over USD4 billion (BDT491.6 billion) of investment in new coal-fired plants.[2] The energy-efficient BLDC fans are also likely to reduce 6,913GWh in annual energy consumption, saving the country BDT89.87 billion (USD0.73 billion) per annum.

More than two-thirds of the households covered in the survey were either unfamiliar with BLDC fans or unaware of their availability in the market. When the surveyors informed the respondents about the fans' energy-saving potential, 96% of the respondents expressed willingness to switch to the energy-efficient models. However, analysis of the survey data by the Institute for Energy Economics and Financial Analysis (IEEFA) shows that the high upfront cost of BLDC fans, combined with low electricity bills among households earning less than BDT25,000 (USD203.42) per month, makes them financially less compelling to this group. For comparison, as opposed to the BDT2,000 (USD16.3) cost of an energy-inefficient fan, BLDC fans cost between BDT5,000 (USD40.7) and BDT6,300 (USD51.3).

[1] Monthly household income levels considered for sampling: 1. Up to BDT25,000, 2. BDT25,001–50,000, 3. BDT50,001–100,000, and 4. Over BDT100,000.
[2] USD to BDT conversion rate used: 1USD = BDT122.9, based on the Bangladesh Bank's bid rate on 30 September 2026.

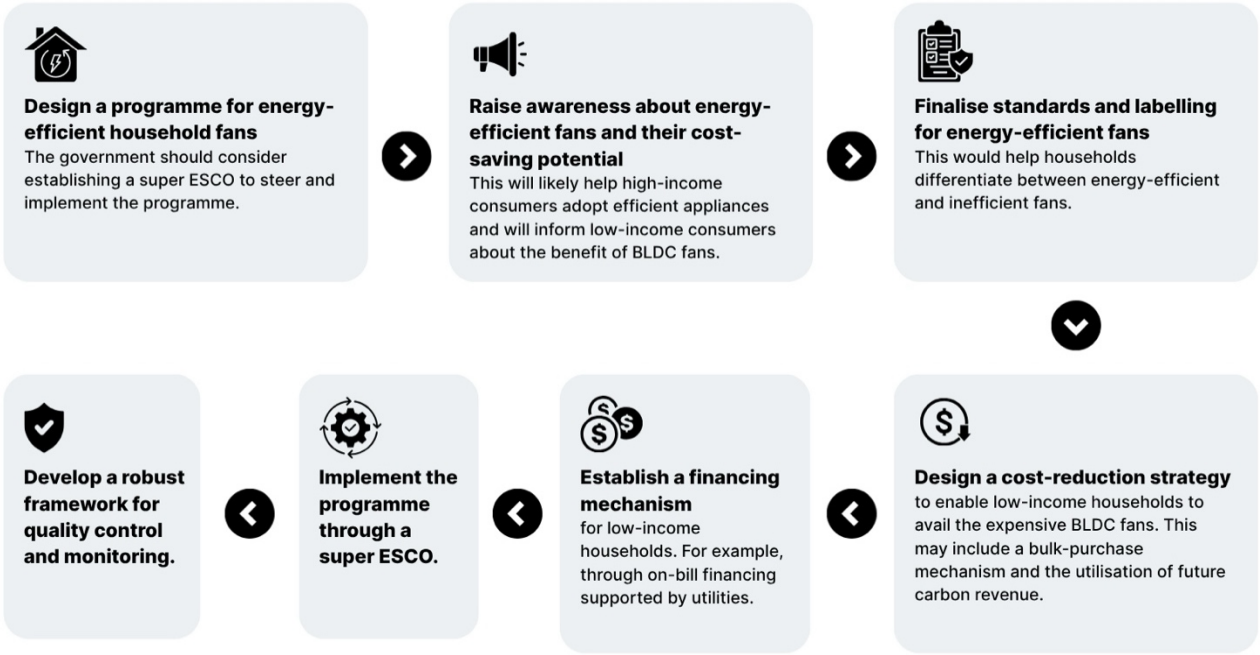
Without any financial support, the payback period of investment in a BLDC fan for low-income households ranges from 7.7 to 9.6 years, depending on average operating hours. Payback periods fall below six years for households in other income groups due to their higher electricity bills.

This report, therefore, recommends designing measures to reduce costs of BLDC fans for low-income households, supported by bulk procurement. The Indian example shows the potential of bulk procurement, which reduced the upfront cost of light-emitting diode (LED) bulbs by 87%. Further, Bangladesh can earn carbon revenue by selling part of the 86 million tonnes of carbon dioxide (CO_2) to be reduced by replacing inefficient fans. This revenue can potentially bring down the price of BLDC fans.

> **While replacing energy-inefficient fans with BLDC fans is both technically and financially desirable, the government should design a clear implementation plan to ensure a smooth and effective transition.**

While replacing energy-inefficient fans with BLDC fans is both technically and financially desirable, the government should design a clear implementation plan to ensure a smooth and effective transition (see figure below). The plan should consider establishing a super Energy Service Company (ESCO) to coordinate the replacement of energy-inefficient fans in around 41 million households. Moreover, it should include an awareness-raising component to inform households about the financial benefits of using BLDC fans. In tandem, the government should develop a cost-reduction strategy through bulk procurement and the use of future carbon revenue. An on-bill financing mechanism could enable households to pay for the BLDC fans in instalments, eliminating the need for high upfront payment. The plan's success will significantly hinge on robust quality control and monitoring to restrict the proliferation of substandard fans.

As Bangladesh's energy sector challenges mount, the country must prioritise measures that can provide quick relief by curbing demand growth. Energy-efficient fans are one such measure, cutting demand as soon as they are installed.


Design a programme for energy-efficient household fans
The government should consider establishing a super ESCO to steer and implement the programme.
Raise awareness about energy-efficient fans and their cost-saving potential
This will likely help high-income consumers adopt efficient appliances and will inform low-income consumers about the benefit of BLDC fans.
Finalise standards and labelling for energy-efficient fans
This would help households differentiate between energy-efficient and inefficient fans.
Design a cost-reduction strategy
to enable low-income households to avail the expensive BLDC fans. This may include a bulk-purchase mechanism and the utilisation of future carbon revenue.
Establish a financing mechanism
for low-income households. For example, through on-bill financing supported by utilities.
Implement the programme through a super ESCO.
Develop a robust framework for quality control and monitoring.

Background

Energy and power supply are fundamental to industrialisation and economic growth. Suppressed energy demand and frequent loadshedding constrain a country's growth potential. Despite its efforts to expand energy supply, Bangladesh is experiencing a period of shortages. Excessive reliance on imported fossil fuels further compounds its difficulties. Meanwhile, inefficient energy use, including in households, places additional stress on utilities. In fact, households consume more than 50% of power generated by Bangladesh's grid.[3] While households have embraced enhanced lighting efficiency by replacing incandescent lamps with light-emitting diode (LED) bulbs, interest in switching to energy-efficient Brushless Direct Current (BLDC) fans remains low.[4]

Since fans remain an affordable means of household space cooling amid rising temperatures, assessing their contribution to household power demand and the potential savings from switching to BLDC fans appears highly relevant.

This report is based on the results of a survey which divides households into different income groups to assess fan usage and ownership (see Annexure 1 for the income groups used in the survey questions). It identifies the share of efficient fans in the current stock of fans used in homes. It then estimates the power and energy demands due to fans, along with the potential power and energy savings from replacing existing fans with BLDC models. The study also offers suitable ways to reduce the upfront costs of BLDC fans to make them viable for low-income household groups.

Rationale for household space cooling efficiency

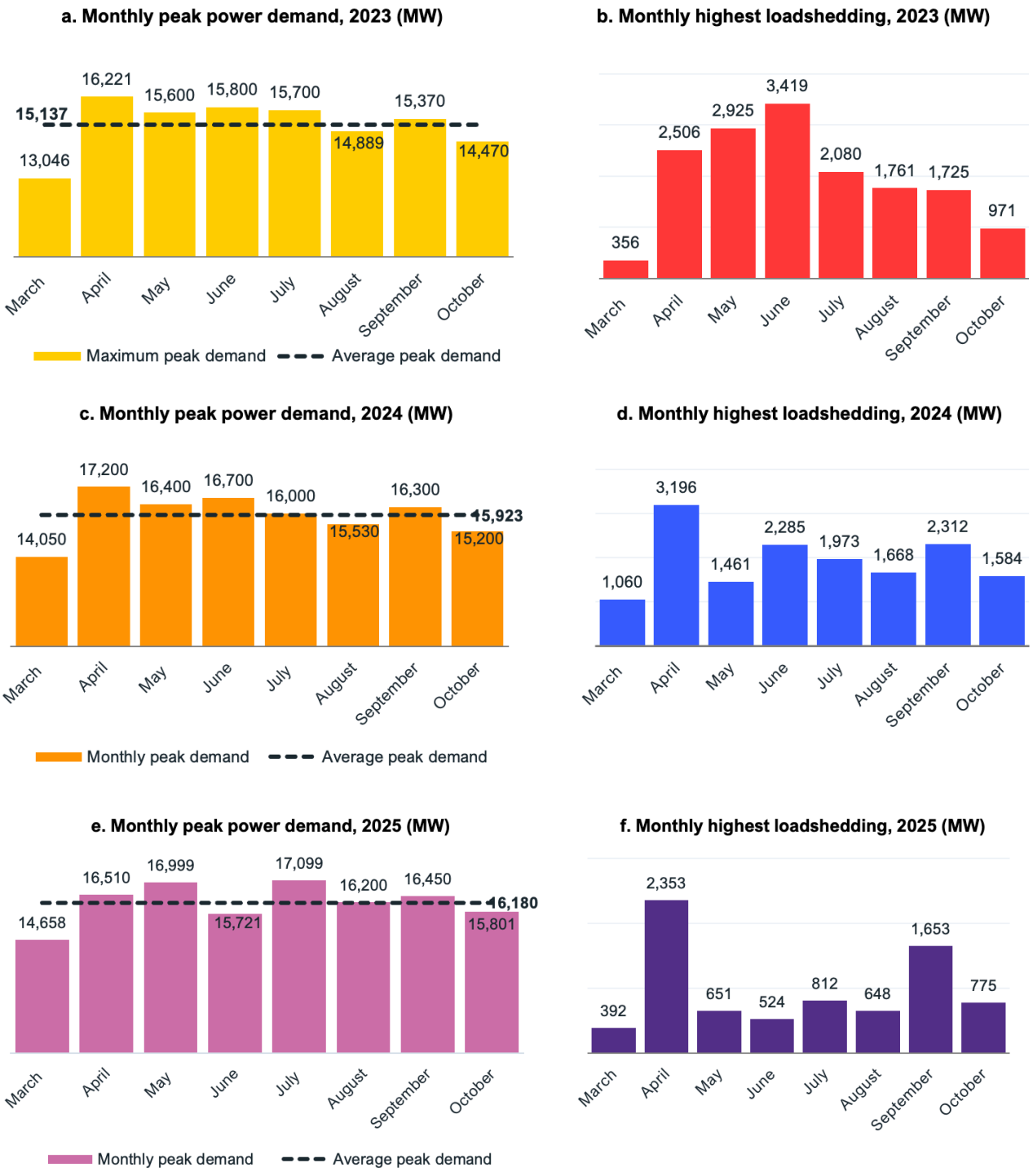
This section shows the trend of Bangladesh's growing power demand and the resultant loadshedding that hurts the economy. It highlights the household sector's power demand growth pattern compared to other sectors and the past trend of household space cooling demand due to fans.

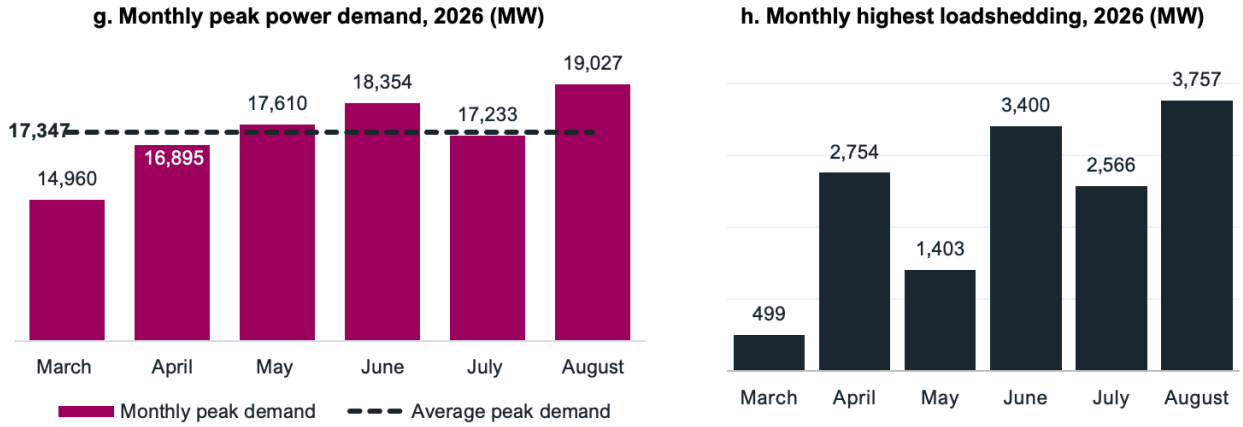
Stress on power grid from rising demand

Bangladesh's power demand has experienced a sudden increase in 2026, with the maximum peak demand reaching 19,027 megawatts (MW) at 9PM on 27 August. This shows an 11.27% spike in maximum peak power demand compared to 17,099MW registered at 9PM on 23 July 2025 (see Figure 1).[5] This increase in power demand has strained the highly import-dependent power sector, leading to heavy loadshedding that frequently surpassed 2,000MW during the peak summer of 2026.

[3] Bangladesh Power Development Board (BPDB). Annual Report 2024-25. 9 October 2025. Page 65.
[4] IEEFA. Higher electricity tariff should accelerate Bangladesh's energy transition. 31 July 2026.
[5] Power Grid Bangladesh PLC. Operation Daily Reports 2024-2025. Date Accessed: 15 August 2026.

Figure 1: Summer power demand and loadshedding trend





Source: Power Grid Bangladesh PLC; IEEFA analysis

The highest shortfall reached 3,757MW in August 2026 against the country's installed capacity of 29,143MW (see Figure 1h).[6,7]

The country experienced a similar pattern with the fossil-fuel price spike in the international market triggered by the Ukraine-Russia crisis. Loadshedding crossed 3,400MW in June 2023 against the peak demand of around 16,000MW and installed power generation capacity of more than 23,500MW (see Figures 1a and 1b).[8,9]

While these patterns may indicate that geopolitical disturbance-led fossil-fuel-price hikes strain Bangladesh's power sector and result in loadshedding, such a hypothesis is not completely tenable. For instance, loadshedding of 3,196MW was recorded at 2PM on 29 April 2024 even without any geopolitical challenge (Note: Peak demand reached 17,200MW at 9PM on 29 April 2024; see Figures 1c and 1d). With comparatively lower temperatures and higher precipitation, the Bangladesh Power Development Board (BPDB) did not feel the need to significantly shed the load in 2025. Still, the loadshedding touched a high of 2,353MW and 1,653MW in April and September 2025, respectively (see Figure 1f).

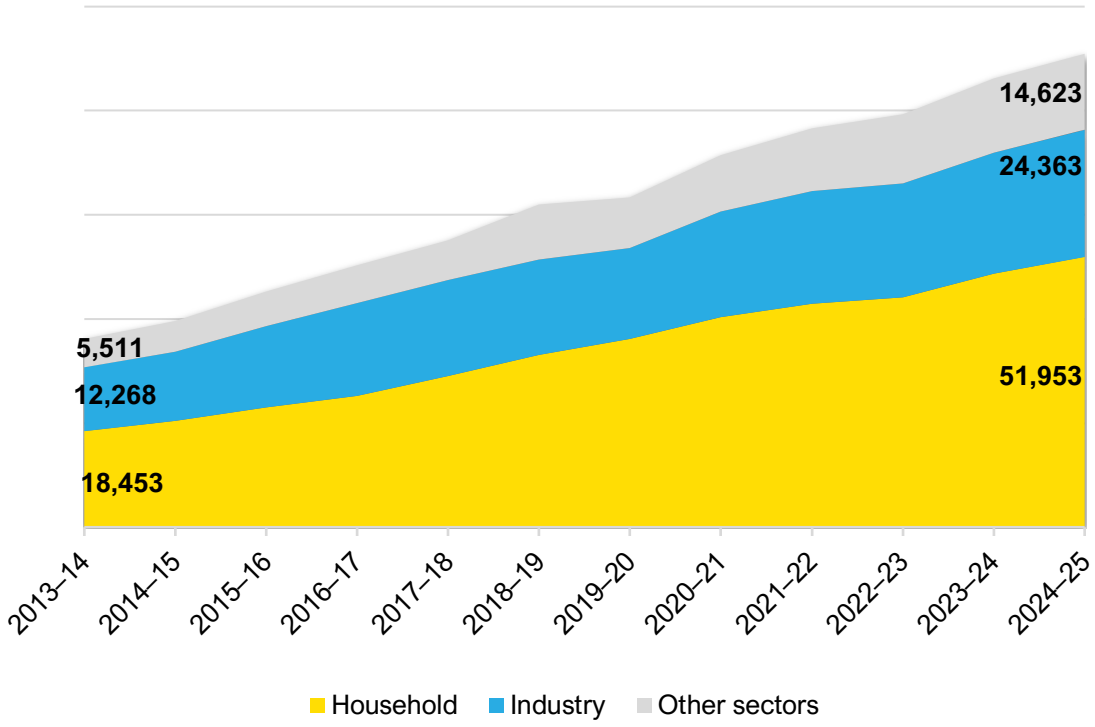
This demonstrates how Bangladesh finds it difficult to meet its rising peak summer demand, underscoring the need to prioritise demand-side management through energy efficiency and conservation.

[6] Power Grid Bangladesh PLC. Operation Daily Reports 2024-2025. Date Accessed: 15 August 2026.
[7] BPDB. Key Statistics. Date Accessed: 1 September 2026.
[8] Power Grid Bangladesh PLC. Operation Daily Reports 2023. Date Accessed: 1 September 2026.
[9] BPDB. Daily Generation Archive. June 2023. Date Accessed: 1 September 2026.

Grid power consumption pattern

A closer inspection of different sectors' grid-based power consumption between fiscal year (FY) 2013-14 and FY2024-25 shows that households drive the major growth in demand. Further analysis reveals that households account for over 50% of the overall grid-based power consumption (see Figure 2).[10] This offers an immediate opportunity to explore the energy-efficiency potential of key household appliances such as fans.

Figure 2: Sectoral grid-power consumption trend (GWh)



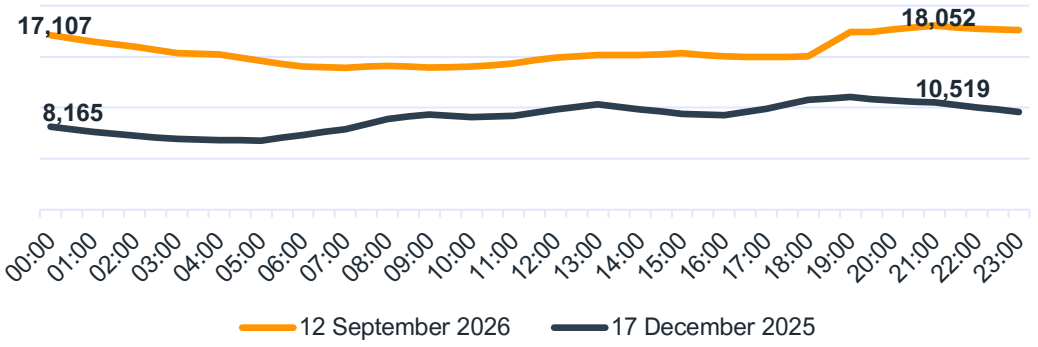
Source: BPDB; IEEFA analysis.
Note: Other sectors include commercial, hospital, education, streetlight, construction, agriculture, electric charging, and more.

Seasonal variation in power demand

Comparing power demand for a summer day versus a winter day shows significant seasonal variation (Figure 3).[11] The lack of a cooling load is one of the key factors that results in the slump in winter power demand. As fans are more affordable than air conditioners (ACs) and are used for long hours, there is a strong case to examine their role in household power demand.

[10] BPDB. Annual Reports 2013-14 to 2024-25. Date Accessed: 10 July 2026.
[11] Power Grid Bangladesh PLC. Operation Daily Reports. Date Accessed: 13 September 2026.

Figure 3: Selected load curves of summer and winter days (MW)

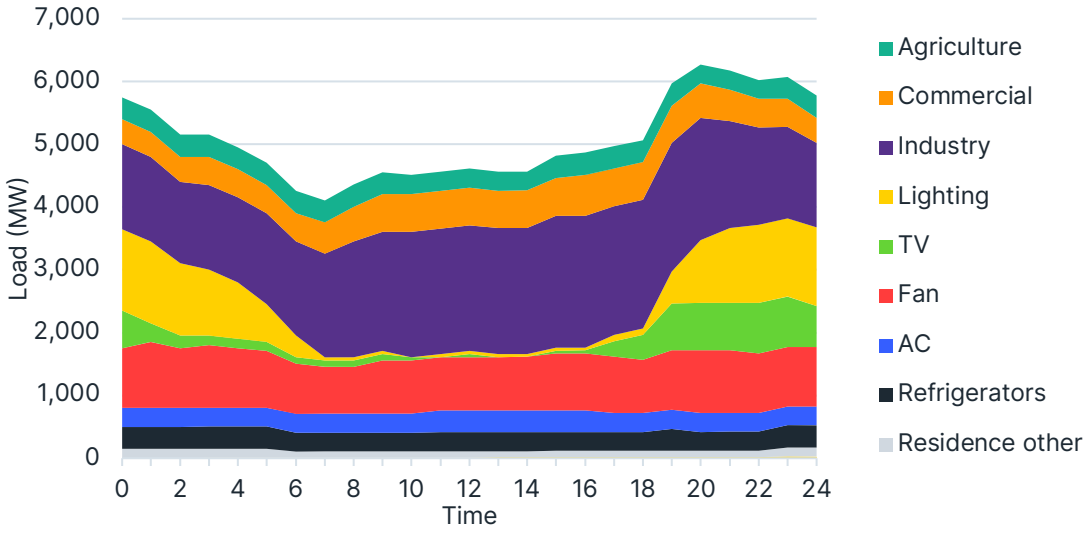


Source: BPDB; IEEFA's analysis

Power demand trends of household cooling fans

A typical load curve of a day in the summer of 2014 showed that fans contributed approximately 1,000MW to the country's 2014 power demand of 4,500–6,000MW (see Figure 4) (Note: The team preparing the Energy Efficiency and Conservation Master Plan estimated this based on the hourly load curve).[12] Besides, fans constituted 6,181GWh of the overall household appliance-related energy demand of 17,570GWh in FY2013-14 (see Figure 5).[13]

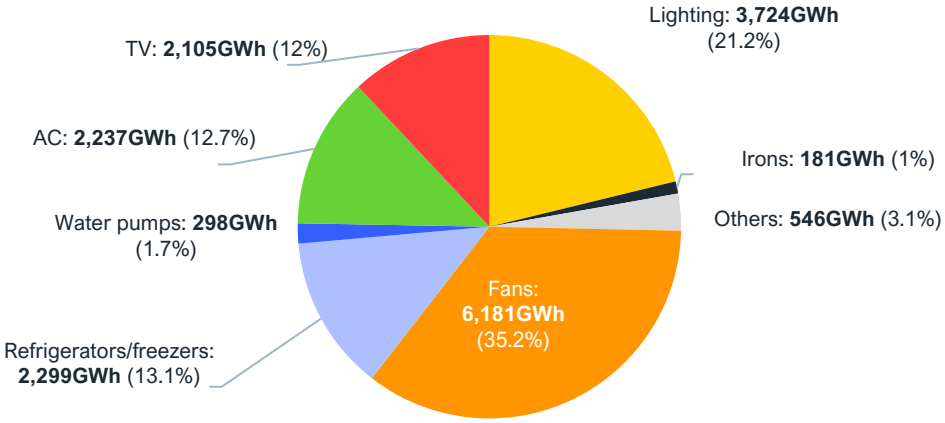
Figure 4: Sectoral power demand (segregated household data shows demand from various appliances), 31 May 2014



Source: World Bank's report citing Energy Efficiency and Conservation Master Plan.[14]

[12] Sustainable and Renewable Energy Development Authority (SREDA). Energy Efficiency and Conservation Master Plan up to 2030. May 2016. Chapter 1, Page 5.
[13] SREDA. Energy Efficiency and Conservation Master Plan up to 2030. May 2016. Chapter 2, Page 5.
[14] World Bank. Demand-side Energy Efficiency Opportunities in Bangladesh. 2017. Page 11.

Figure 5: Energy demand of different household appliances, FY2013-14



Source: Energy Efficiency and Conservation Master Plan (Chapter 2, Page 5).

Survey design

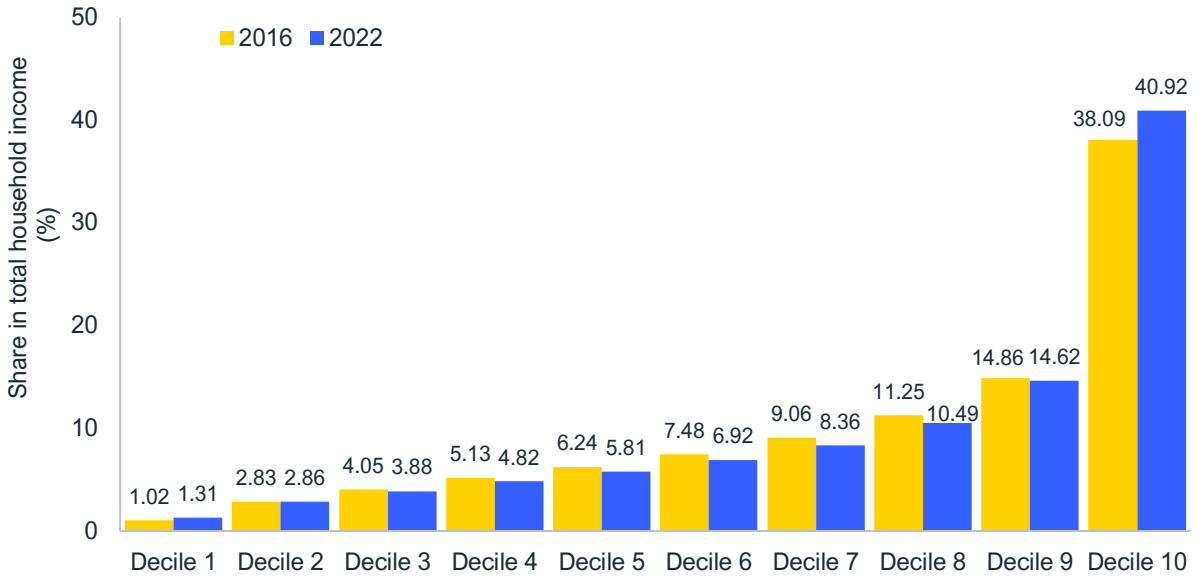
This study builds on primary data from household fans to determine their space cooling load. This section offers an overview of the survey design, income-wise distribution of households, and sample size. It also offers insights into the use of efficient fans among households (Note: The available BLDC fans in Bangladesh have a rated power consumption of around 35 watts (W), compared with energy-inefficient fans of 70W or more. Due to lower energy consumption, BLDC fans are considered energy efficient.)[15]

Selection of income group

The survey deploys stratified sampling based on monthly household income. It divides households into four strata based on income level per month. These are: up to BDT25,000 (USD203.42), BDT25,001–50,000 (USD203.43–406.84), BDT50,001–1,00,000 (USD406.84–813.7), and over BDT1,00,000 (USD813.7). It then analyses Bangladesh's Household Income and Expenditure Survey 2022 and estimates the proportion of the population that belongs to different income strata in 2026 (see Figure 6).[16] It finds that around 40% of the bottom-most households fall into the category of up to BDT25,000/month (USD203.42/month) in 2026, with the average income of the stratum at around BDT14,600/month (USD118.8/month) (see Table 1 for the income distribution of households in 2026). This is consistent with another study released in 2025, which showed that the bottom 40% of households have an average monthly income of BDT14,881/month (USD121.1/month).[17]

[15] This study considers ceiling fans, the most widely used type in households.
[16] Bangladesh Bureau of Statistics (BBS). Household Income and Expenditure Survey 2022. 14 December 2023. Page 35.
[17] Prothom Alo. 80pc families spend more than they earn. 29 August 2025.

Figure 6: Household income distribution



Source: Adapted from the Household Income and Expenditure Survey of BBS.[18]
Note: This income distribution divides households into 10 deciles with Decile 10 (top 10%) accounting for 40.92% of total household income in 2022. The remaining deciles show their contribution in the national household income. The BBS survey also reported that the average household income in 2022 was BDT32,422, which helps estimate the overall household income using the total number of households. It is further possible to estimate the average income of different deciles. For 2026 estimates, a 40% rise in average household income is considered. The Household Income and Expenditure Survey 2022 found a 100% rise in average household income in 2016–2022 and a 39.3% rise in 2010–2016. Since Bangladesh has been experiencing subdued growth in recent years, this study considers a 40% increase in income in 2022–2026.

Table 1: Estimated distribution of households according to monthly income, 2026

Income per month (BDT)	Percentage of households
Up to 25,000	40%
25,001–50,000	20%
50,001–100,000	30%
More than 100,000	10%*

*More than 10% of households belong to the group with a monthly income of over BDT1,00,000 (USD813.7). For simplicity and to align with the Household Income and Expenditure Survey's classification by decile, this study defines this group as the top 10% of households. Bangladesh reportedly has 43.1 million household electricity consumers.[19] As a conservative estimate, this study considers household consumers to be 41 million by discounting 5% of the reported number, as some people living in urban areas only occasionally visit their ancestral homes in rural areas.

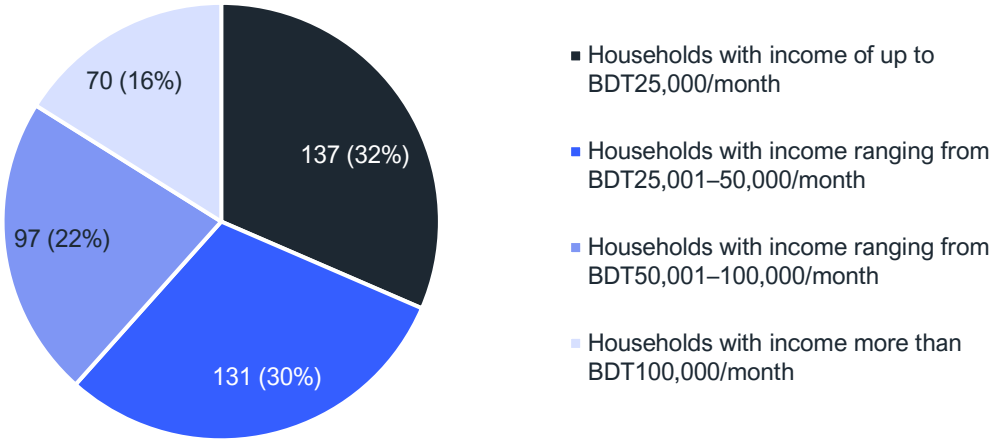
Source: IEEFA projection, based on the Household Income and Expenditure Survey of BBS.[20]

[18] BBS. Household Income and Expenditure Survey 2022. 14 December 2023. Page 35.
[19] Prothom Alo. Different tactics in power price hike: Lower middle class to face greater pressure. 12 May 2026.
[20] BBS. Household Income and Expenditure Survey 2022. 14 December 2023. Page 35.

Sample size

The survey applies a 90/10 sampling technique, which requires a minimum of 68 samples per stratum (see Annexure 2).[21,22] However, the survey considers more samples for the income group that represents a higher share of households (see Table 1 and Figure 7). The survey covers responses from 26 of the country's 64 districts, covering both rural and urban areas (see Annexure 2 for names of the districts).

Figure 7: Representation of households in the survey



Source: IEEFA's survey

Survey results

The preliminary survey data includes the ownership of fans in each house surveyed and the maximum number of fans each uses during the summer. It also records the number of fans used during different periods of the day (7AM–7PM, 7PM–11PM, and 11PM–7AM) and the actual hours the fans operate. This section analyses the data required to estimate power and energy demand from fans.

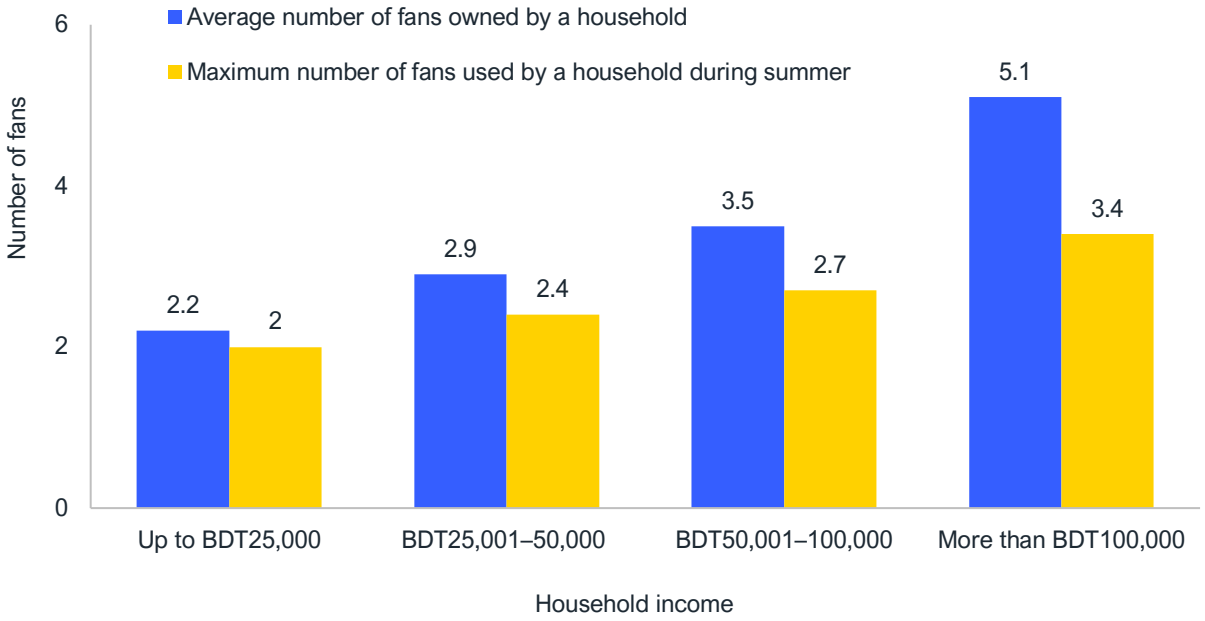
Fan ownership and usage

Households own an average of 2.2 to 5.1 fans, depending on their income category (see Figure 8a). However, during the summer, they use an average of 2 to 3.4 fans. There is also significant variation in the use of fans during different periods of a summer day (see Figure 8b). Moreover, average fan usage by different groups of households ranges from 1.4 to 2.3 during a summer day (see Figure 8c).

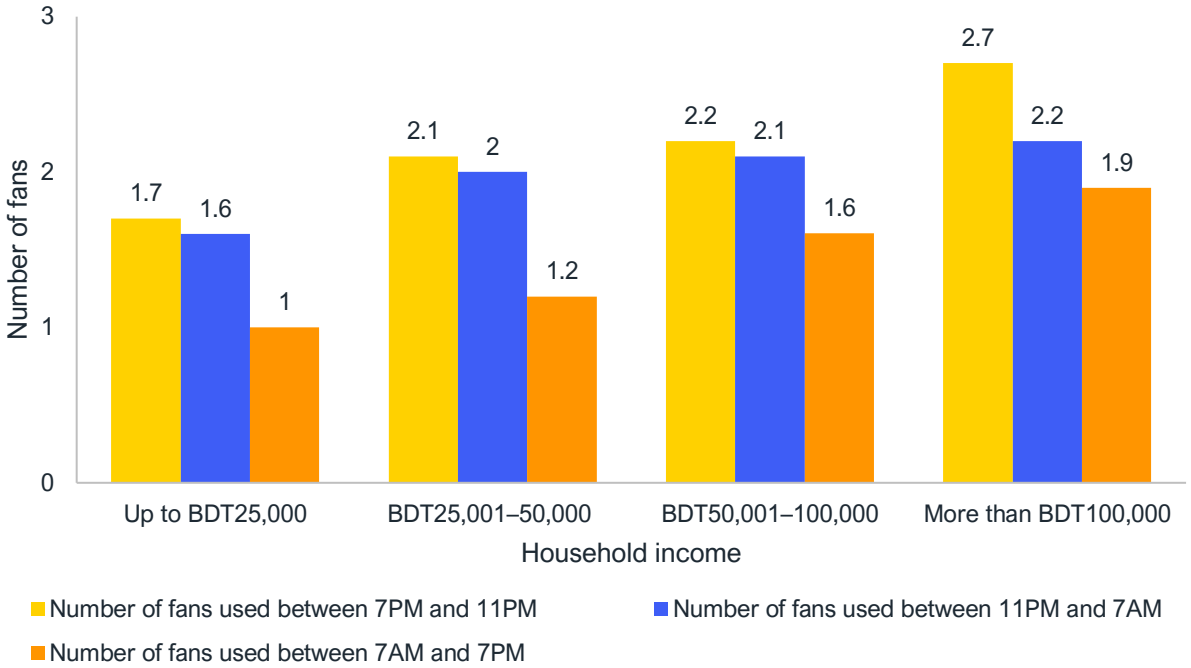
[21] Using Cochran's formula for a large population (see Annexure 2).
[22] International Journal of Economics, Commerce and Management. Sampling Techniques & Determination of Sample Size in Applied Statistics Research: An Overview. Volume II, Issue 11. November 2014. Page 14.

Figure 8: Fan ownership and summer usage across household income groups

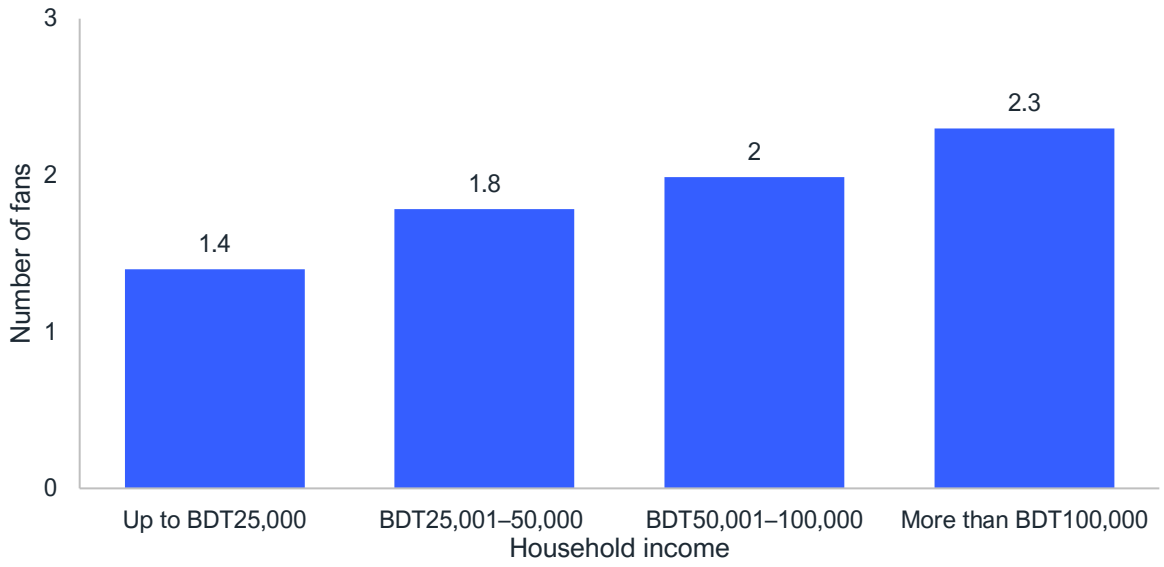
8a. Average number of fans owned versus maximum number of fans used



8b. Average number of fans used during different periods of a day



8c. Average number of fans used during a day by different income groups

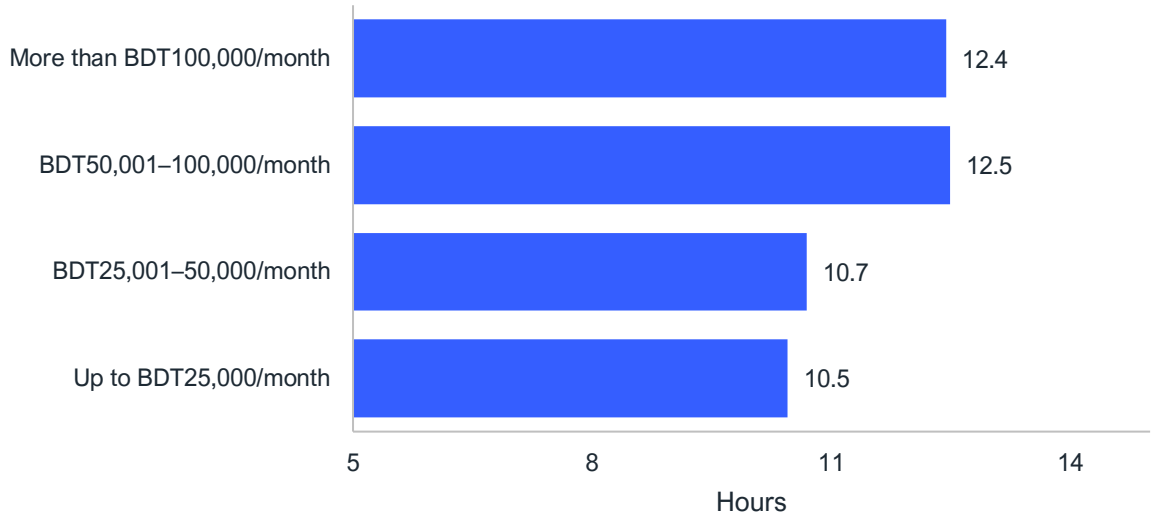


Source: IEEFA analysis based on its survey

Operating periods

The average operating hours of fans range from 10.5 hours to 12.4 hours a day, with the duration of use increasing in higher-income groups (see Figure 9).

Figure 9: Average fan operating hours by household income groups

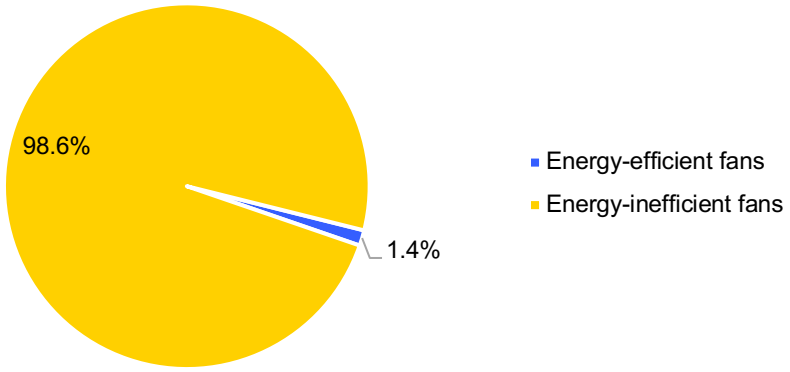


Source: IEEFA analysis based on its survey

Share of energy-efficient fans in households

The adoption of energy-efficient fans is at a nascent stage in the country, with the survey estimating the share of inefficient fans at around 98.6% (see Figure 10).[23]

Figure 10: Share of energy-efficient fans

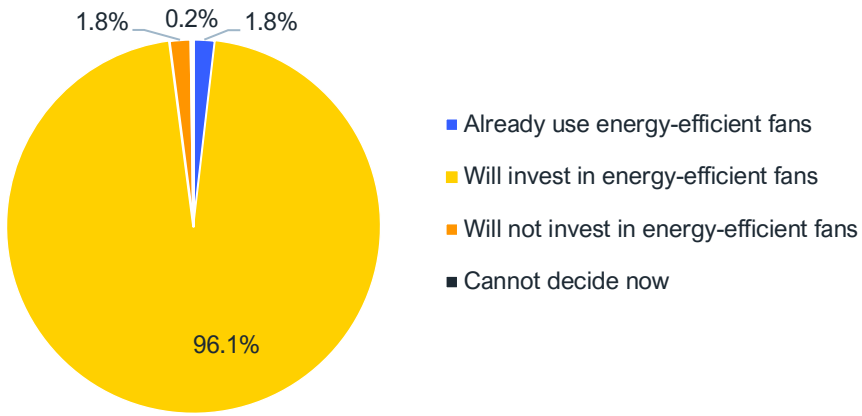


Source: IEEFA analysis based on its survey

Consumer willingness to switch to energy-efficient fans

Most households report that they are willing to invest in BLDC fans to save energy and costs. As electricity tariffs rise, the households feel an urgent need to reduce their power costs. The survey reveals that 96.1% of households plan to replace energy-inefficient fans gradually to cut down on electricity bills (see Figure 11). Only 1.8% of the households plan to wait until their existing fans need to be changed.

Figure 11: Willingness to shift to energy-efficient fans



Source: IEEFA analysis based on its survey

[23] For simplicity, IEEFA assumes all inefficient fans as consuming 70W of power.

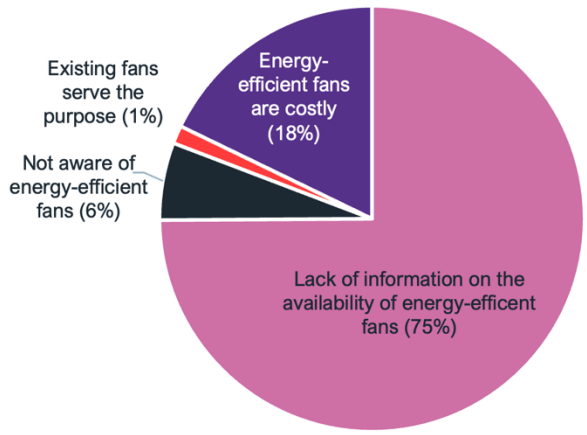
Requirement for consumer support

As most of the sample households expressed their desire to own energy-efficient BLDC fans, the survey examines the reasons holding them back. The responses point to clear gaps that policymakers should address. For instance, 75% of the sample households did not have information on the availability of these fans and 6% were unaware of such fans (see Figure 12a). Therefore, SREDA, which is mandated to promote energy efficiency, should design and organise awareness-raising programmes across the country.

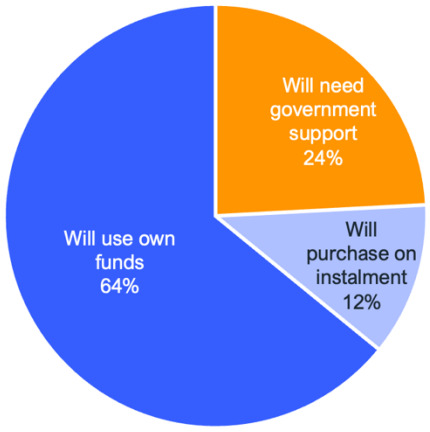
BLDC fans available in the market cost around BDT5,000 (USD40.7) to BDT6,300 (USD51.3) compared to energy-inefficient fans that cost around BDT2,000 (USD16.3).[24,25] Given this price gap, 18% of the sample households shared that they could not afford such fans (see Figure 12a). Consequently, the survey enquired whether households would need support to invest in the comparatively expensive BLDC fans. Around 64% of the households expressed willingness to invest their own money to purchase these fans (see Figure 12b). While 12% said they would prefer an instalment facility, the remaining 24% said they would require government support to replace their inefficient fans. As 40% of the households earn only up to BDT25,000 per month (USD203.42 per month), many households will need financial support to purchase energy-efficient fans (see Table 1).

Figure 12: Households' views on financial support for energy-efficient fans

12a. Reasons behind low uptake



12b. Investment options to increase uptake



Source: IEEFA analysis based on its survey

[24] A Click BLDC fan of 35W costs BDT5,000 whereas a Walton fan of same wattage costs BDT6,300. Some companies offer 35W BLDC fans at even higher prices.
[25] An energy-inefficient fan costs around BDT2,000.

Power and energy demands led by fans

This study assumes that the sample households and the fans it considered are representative of the overall domestic sector. Therefore, based on fan-usage data during different hours of a summer day and the current adoption of BLDC fans, the study estimates the maximum household power demand led by fans (see Table 1 and Figures 8b and 10). This ranges from 3,362MW to 5,212MW (see Table 2 and Annexure 3). The highest demand is during 7PM–11PM, with the peak hour around 9PM.

Contrary to the belief that the fan-led space cooling demand remains almost steady throughout the day, the survey finds that the use of fans in households is comparatively low during 7AM–7PM. During these hours, professionals, businesspeople, and students spend considerable time away from home, leading to a lower demand for household cooling.

Table 2: Estimated power demand due to household fans

Household income group (BDT)	Maximum demand during 7AM–7PM (MW)	Maximum demand during 7PM–11PM (MW)	Maximum demand during 11PM–7AM (MW)
Up to 25,000	1,148	1,951.6	1,836.8
25,001–50,000	688.8	1,205.4	1,148
50,001–100,000	1,372.3	1,887	1,801.2
Over 100,000	525.9	747.4	609
Sub-total	3,735	5,791.4	5,395
Margin of error (10%)	373.5	579.1	539.5
Total	**~3,362**	**~5,212**	**~4,855**

The study also calculates the maximum annual energy consumption by fans for space cooling. For each income category, it takes into account the average number of fans each household uses for the average number of hours per day (see Figures 8c, 9, and 10). Further, considering average fan usage of nine months a year, the study projects their annual energy consumption at 13,916GWh (see Table 3 and Annexure 3).

Table 3: Estimated energy demand due to household fans

Household income group (BDT)	Energy demand (GWh)
Up to 25,000	4,556.4
25,001–50,000	2,984.9
50,001–100,000	5,789.6
Over 100,000	2,131.5
Sub-total	15,462.4
Margin of error (10%)	1,546.2
Total	**~13,916**

Estimating power- and energy-saving potential

The projected power-saving potential of BLDC fans is 1,670MW–2,590MW (see Figure 13 and Annexure 4). This estimate is based on an alternative scenario in which all households shift to energy-efficient BLDC fans (Note: A complete, nation-wide shift will take time). This method accounts for the household's representation in different income groups, variation in demand for space cooling at different times of the day, and the proportion of energy-inefficient fans (see Table 1, Figures 8b and 10).

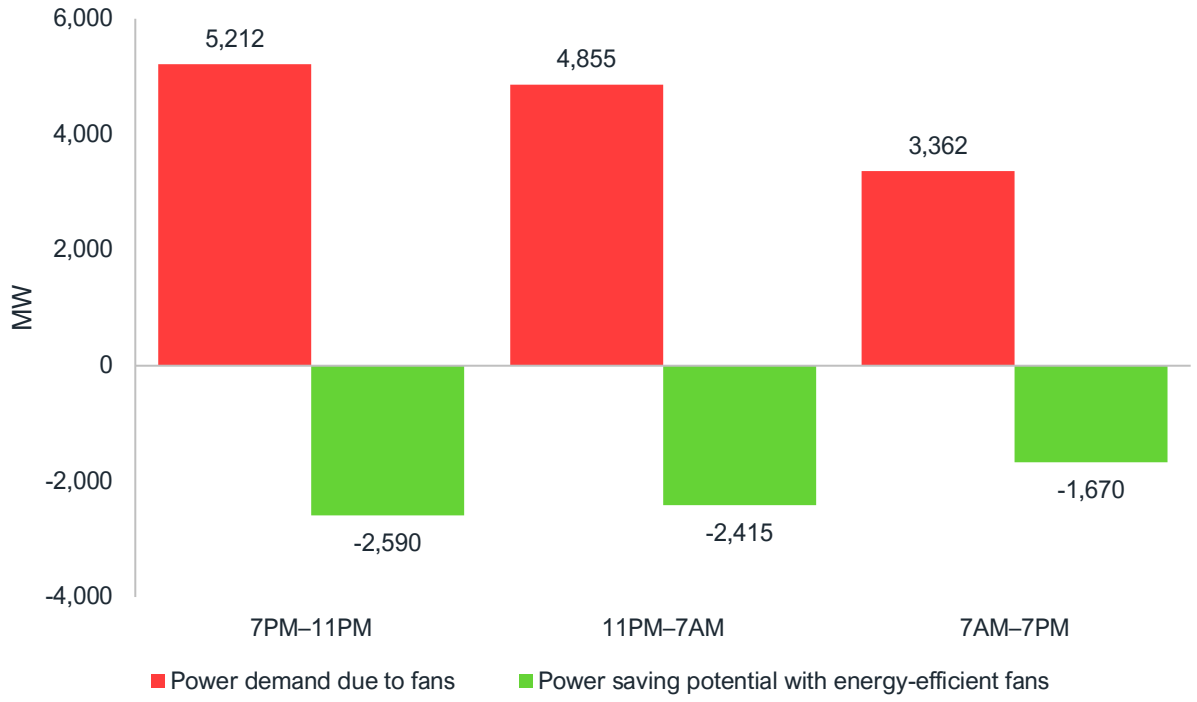
> **Reducing the power demand by up to 2,590MW can help Bangladesh avoid a one-off capital investment of over USD4 billion (BDT491.6 billion) in future coal-fired power plants.**

Reducing the power demand by up to 2,590MW can help Bangladesh avoid a one-off capital investment of over USD4 billion (BDT491.6 billion) in future coal-fired power plants.[26] This saving is enough to cover the cost of replacing the energy-inefficient fans in all of Bangladesh's households with BLDC fans.[27,28,29,30]

Likewise, the use of efficient fans could reduce energy consumption by 6,913GWh per annum, saving the country BDT89.87 billion (USD0.73 billion) in costs (see Annexure 4). This assumes the average use of 1.4 to 2.3 fans per household for an average of 10.5–12.5 operating hours per day during summer months (see Figures 8c, 9, and 10).

[26] The recorded capital investment in Rampal coal-fired power projects for a firm capacity of 1,234MW was USD2 billion (BDT247.8 billion). This results in a capital cost of USD1.62 million (BDT199.1 million) per MW of a coal-fired plant. The capital investment requirement for coal-fired plants of a combined capacity of 2,590MW will cross USD4 billion (BDT491.6 billion).
[27] Maximum number of fans used: Total households * Proportion of households earning up to BDT25,000/month * Maximum number of fans used by a household of this group + Total households * Proportion of the households earning BDT25,000–50,000/month * Maximum number of fans used by a household of this group + Total households * Proportion of households earning BDT50,000–100,000/month * Maximum number of fans used by a household of this group + Total households * Proportion of the households earning more than BDT1,00,000/month * Maximum number of fans used by household of this group = 41*40%*2+41*20%*2.4+41*30%*2.7 +41*10%*3.4 = 99.63 million =~100 million. This number is slightly higher than the maximum number of fans used during a period of a day as a family may operate a fan between 7PM and 11PM in its reading room but may not require it between 11PM and 7AM.
[28] Total fans to be replaced = 100 * (1–1.4%) = 98.6 million (Note: 1.4% of the operational fans are BLDC fans)
[29] Capital investment to replace inefficient fans: 98.6 million fans * BDT5,000/ fan = BDT493,00 million = BDT493 billion = USD4 billion (taking BDT5,000 to purchase a Click BLDC fan). Assuming a 25% reduction in cost in case of a bulk procurement, total investment comes down to: 493 * (1-25%) = BDT369.75 billion = USD3 billion.
[30] Walton's BLDC fan costs BDT6,300. Assuming that bulk procurement will lead to a cost reduction of at least 25%, the total investment to replace operational fans will reach 98.6 million fans * BDT6,300/fan * 75% = BDT465.885 billion = USD3.8 billion

Figure 13: Power-saving potential by replacing energy-inefficient fans



Source: IEEFA analysis

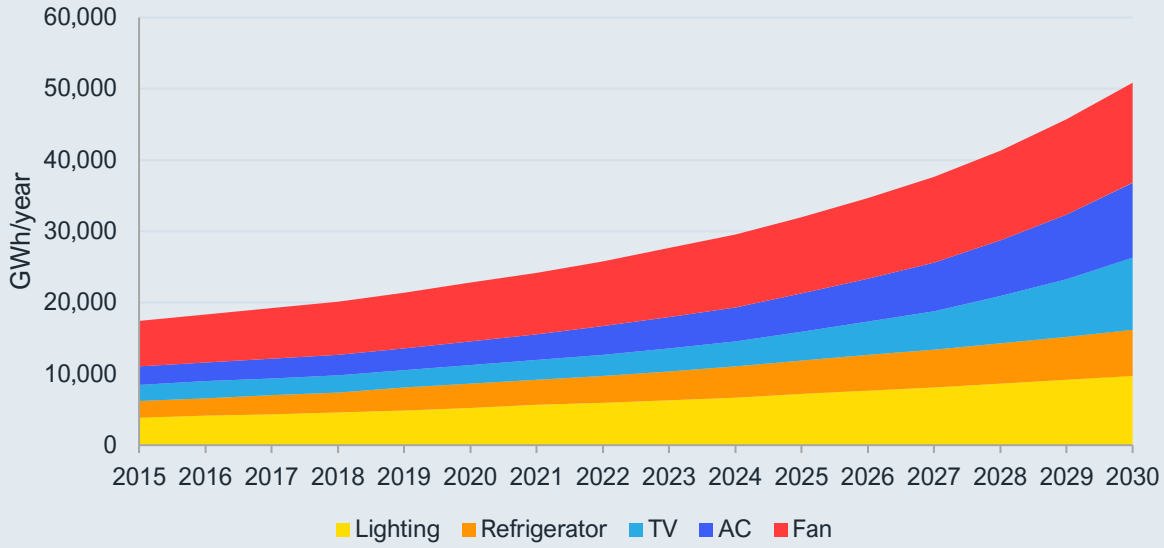
Box 1: Rationality check of the estimated energy and power savings

In 2015, the Bangladesh government projected that energy consumption due to different appliances would reach around 35,000GWh in 2026 before marginally crossing 50,000GWh in 2030 (see Figure 14). IEEFA's analysis of the figure shows that the energy demand due to fans was supposed to reach at least 11,000GWh (Note: This demand also includes energy consumption of commercial and industrial sector fans). However, household energy consumption already crossed 50,000GWh in FY2024-25. Therefore, energy consumption of household fans has likely reached IEEFA's projected consumption of 13,916GWh per year.

Furthermore, the draft Bangladesh National Cooling Plan up to 2035 forecasts that energy consumption from household fans will likely reach 22,174GWh in 2035.[31] With rising awareness, people would replace their high-wattage fans with efficient ones when demand arises in the future. The number of fans is expected to saturate in the next decade. This also substantiates that Bangladesh's current annual energy demand for household fans is in the order of 13,916GWh. Hence, IEEFA's estimates are aligned with the country's draft national cooling action plan.

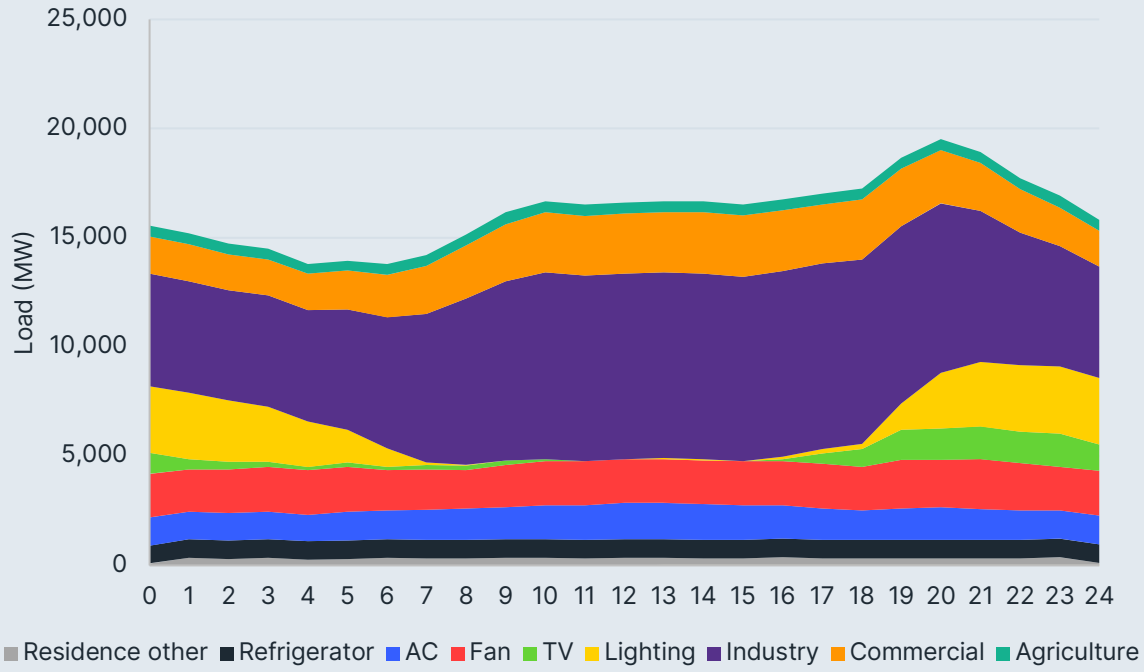
[31] Government of the People's Republic of Bangladesh. Draft Bangladesh National Cooling Action Plan up to 2035. Date Accessed: 26 August 2026. Page 84, Section: Cooling Action Plan.

Figure 14: Energy consumption by different appliances in 2030 (FY2013-14 projection)



Source: World Bank's report citing energy efficiency and conservation master plan[32]

Figure 15: Power demand of different sectors (segregated household data shows power demand of different appliances) in 2030 (FY2013-14 projection)



[32] World Bank. Demand-side energy efficiency opportunities in Bangladesh. 2017. Page 11.

Similarly, IEEFA's assessment of power demand from household fans appears appropriate. The government forecast for 2030 shows that the country's business-as-usual power demand will reach 20,000MW in 2030, with fans accounting for 2,300–2,400MW (see Figure 15). The prediction further showed a significant industry-led power demand, staying at around 8,000MW during 7AM–6PM while moving from 4,000MW–6,000MW during other times of the day.

However, Bangladesh's peak power demand crossed 19,000MW in August 2026 and the industrial sector continues to show sluggish demand for grid power due to its reliance on gas-fired captive generators.[33] Meanwhile, the household sector's share of power demand remains above 50%. As offices and big businesses remain closed after 9PM and few industries operate through the night, households account for most of the power demand after 9PM. Demand reportedly moved around 17,000MW–18,000MW after 9PM from June 2026 onwards, with households likely contributing around 12,000–13,000MW of that load. Hence, the maximum household space cooling demand resulting from fans is likely to be around 5,000MW.

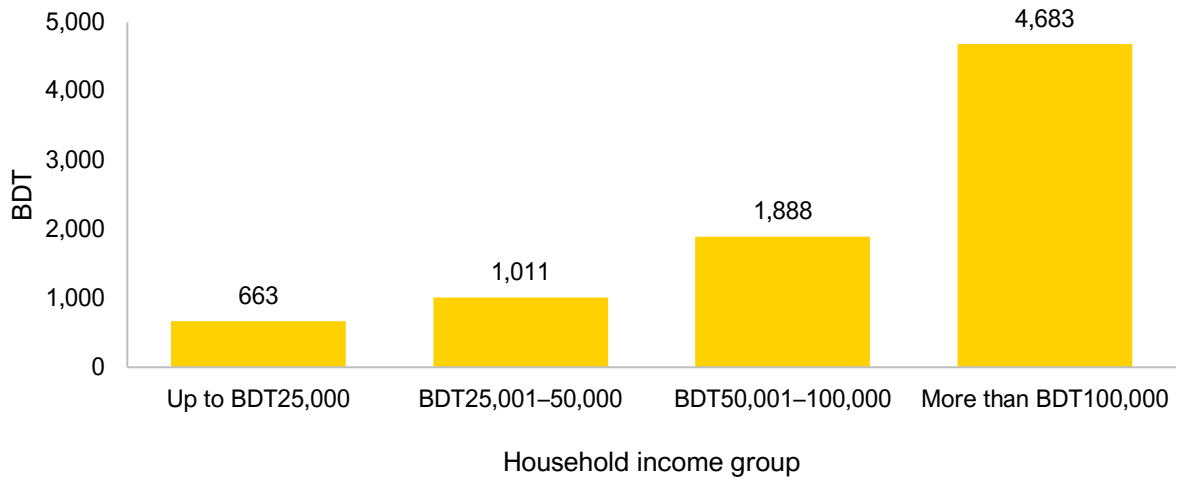
Feasibility assessment

Energy-efficient BLDC fans cost two to three times as much as inefficient fans. As low-income households have limited savings, it is important to assess their monthly electricity bills and monetary savings from BLDC fans. The survey data shows that households in the two lowest income groups pay a monthly average electricity bill of BDT663 (USD5.4) and BDT1,011 (USD8.23), respectively (see Figure 16).

These monthly bills help identify the tariff slabs the household income groups belong to and estimate how much a household would save per month by installing an energy-efficient fan. Considering an operational period of nine months per year, the payback periods show that BLDC fans are not financially viable for households with incomes up to BDT25,000 per month (see Figure 17 and Annexure 5). However, households with incomes of BDT25,001–50,000 and BDT50,001–100,000 per month will find the investment feasible when they use fans for more than 10 hours. Households with a monthly income of over BDT100,000 pay higher electricity bills and can recover their investment in energy-efficient fans quickly.

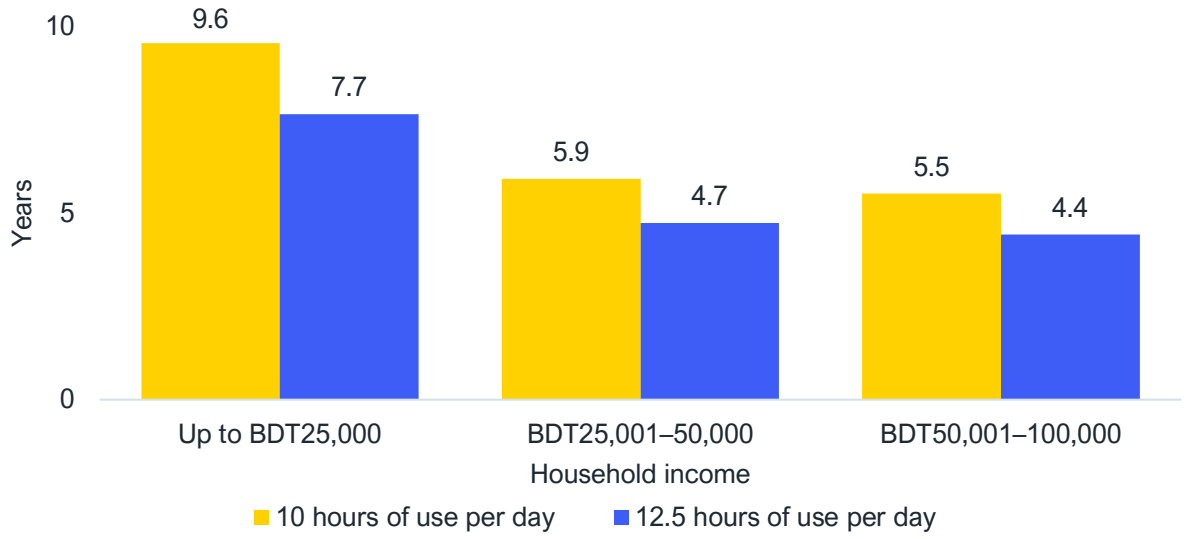
[33] Power Grid Bangladesh PLC. Operation Daily Reports. Date Accessed: 1 September 2026.

Figure 16: Average monthly electricity bills during summer



Source: IEEFA analysis based on its survey

Figure 17: Payback period of investment in energy-efficient fans



Source: IEEFA analysis based on its survey

Supporting instruments

Replacing high-energy-consuming household fans with energy-efficient ones is highly feasible from the national perspective. It is also desirable from utilities' point of view as they find themselves stretched amid rising power demand. However, the payback calculation shows that high costs would prevent low-income households from replacing energy-inefficient fans. IEEFA's survey results also

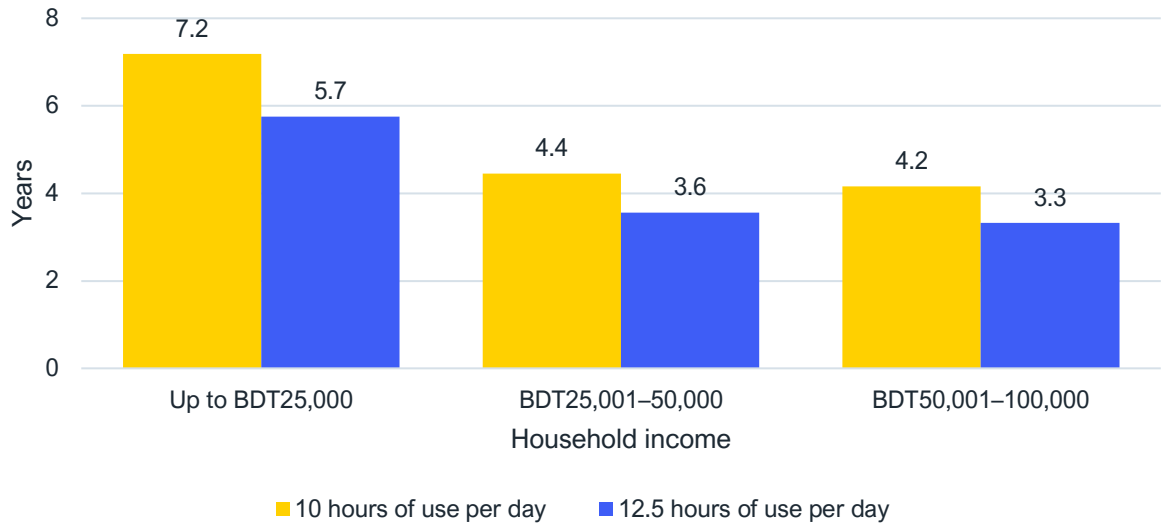
highlight the importance of government support, as 24% of the respondents said they need financial help.

All this makes a case for designing supporting instruments, especially for low-income households. However, to transform the sector in three to five years, the government could create schemes that are attractive across all household income groups. As the power and energy sectors are already financially distressed, Bangladesh may consider designing a strategy to bring down the cost of BLDC fans through bulk procurement and carbon revenue support.

Bulk procurement and carbon revenue

Bangladesh will need to replace 98.6 million inefficient fans for the household sector's transformation.[34] To achieve this, the government could undertake a phased approach, starting with an initial goal of replacing 10 or 20 million fans, enabling bulk procurement to significantly reduce costs. A similar example exists in India's promotion of light-emitting diode (LED) bulbs, which led to 87% cost reductions.[35]

Figure 18: Payback period of investment in energy-efficient fans under support measures
18a: Payback period under bulk procurement



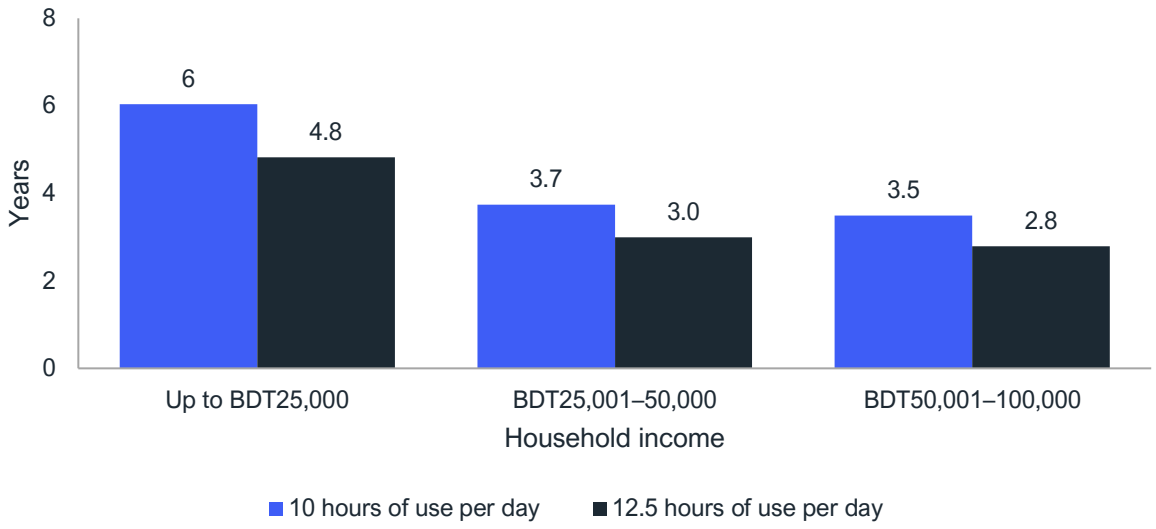
Source: IEEFA analysis based on its survey

[34] See footnote 28.
[35] Sustainable Success Stories. Date Accessed: 20 August 2026.

IEEFA assumes that a bulk procurement could cut prices by about 25%, reducing payback periods for households across income groups. However, payback periods for low-income households still range from 5.7 to 7.2 years (see Figure 18a).

With the estimated annual energy savings of 6,913GWh, Bangladesh could reduce more than 86 million tonnes of CO_2 over 20 years.[36] This could help the country earn carbon revenue of USD259.88 million (BDT31.94 billion) over this period.[37] By recycling this revenue, the government can provide BDT600 (USD4.88) as capital subsidy per fan for more than 50 million energy-efficient fans, likely making investment feasible for low-income households (see Figure 18b).

18b. Payback period under bulk procurement and carbon revenue



Source: IEEFA analysis based on its survey

The case for a super ESCO

Often, significant energy efficiency potential in a country remains untapped due to the absence of a suitable organisation that can leverage finance, implement the project, and offer post-implementation monitoring to ensure the operation of an appliance at the desired level of efficiency. Furthermore, the scale of replacement efforts requires an organisation with technical, financial, managerial, and monitoring capacities.

A super Energy Service Company (ESCO), backed by the government, could deliver these services effectively. As an example, India's Energy Efficiency Services Limited has successfully managed

[36] Using the grid emission factor of 0.62tonnes of CO_2/MWh for Bangladesh and an effective fan lifespan of 20 years.
[37] Assuming that 60% of the emission reductions will be sold for USD5/tonne of CO_2.

various interventions, including its lighting efficiency programme, leading to a significant reduction in the initial cost of LED bulbs.

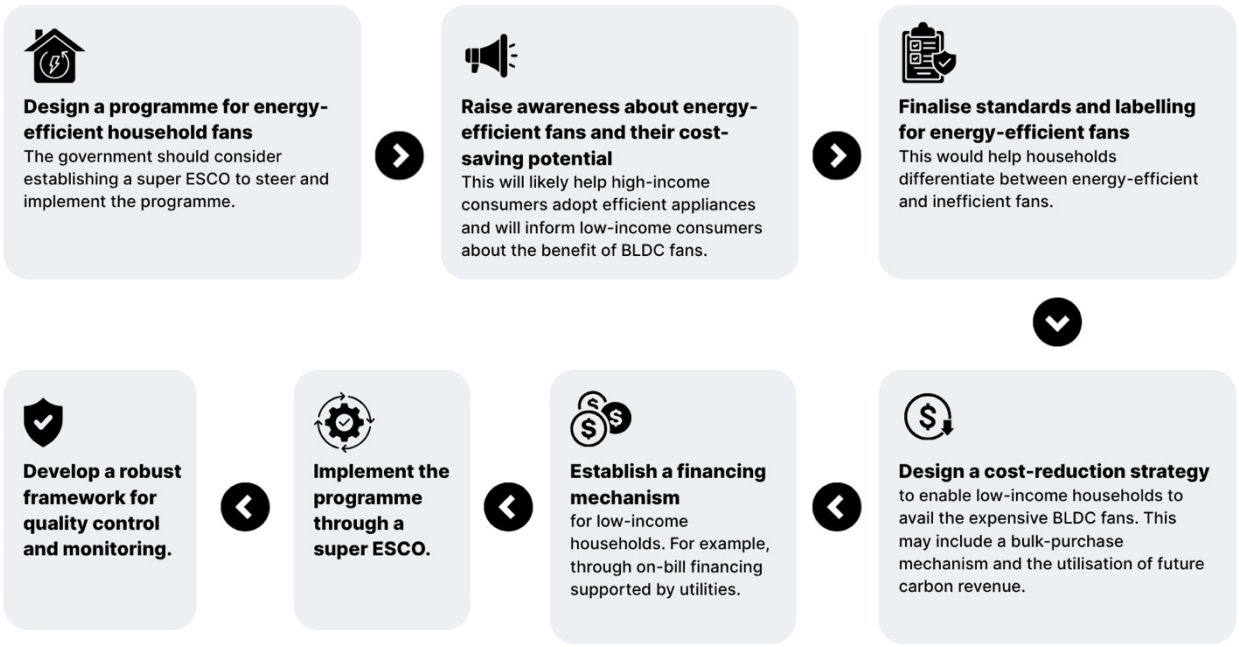
As household space cooling efficiency improvement in Bangladesh, led by efficient fans, involves the engagement of over 40 million households, the government may assess the feasibility of establishing a super ESCO that has the capacity to navigate such a large project. In addition to reducing the upfront cost of BLDC fans, the super ESCO could implement the steps needed to sell avoided carbon emissions from the project in the international market. The super ESCO, supported by distribution utilities, could recover the upfront cost of BLDC fans through the monthly household cost savings instead of charging the cost during the implementation.

This may help quickly scale up BLDC fans in the country while ensuring that low-income groups do not experience the burden of high upfront investment.

Way forward

This study proposes a seven-step approach to transform household space cooling by replacing energy-inefficient fans (see Figure 19). As a first step, the government should design a national programme and critically evaluate the need for a super ESCO. As a lack of awareness holds back the uptake of BLDC fans, the government should conduct national-level awareness-raising programmes. In parallel, it should finalise the standards and labels for fans, helping consumers when they are selecting new fans.

Figure 19: Implementation framework of household programme on energy-efficient fans



It should also design a strategy to encourage wider dissemination of BLDC fans across the country, followed by designing an appropriate financing mechanism to reduce the burden of upfront costs. On-bill financing, tagged with utilities, can offer such benefits to households. The super ESCO should then implement the programme, ensure quality, and monitor performance through its team.

> **As Bangladesh faces a period of energy supply constraints, it must utilise measures to reduce inefficient energy use.**

As Bangladesh faces a period of energy supply constraints, it must utilise measures to reduce inefficient energy use. Energy-efficient BLDC fans offer a double dividend: significant household energy savings and avoided investment in new fossil-fuel power plants.

Annexure 1: Questionnaire

Respondent's details

1. Location:
2. Income level (BDT/month)
   i. Up to 25,000
   ii. 25,001–50,000
   iii. 50,001–100,000
   iv. More than 100,000
3. Number of family members:
4. Average monthly electricity bills during the summer (BDT):

Information on fans

5. How many fans do you use at your home ……
6. Can you please tell us about the brand name or company from which you bought your fans (Singer, Vision etc.)?
   i. ……..….. ii. …….. iii. …….
   iv. …….. v. …….. vi. …….
7. What is the average use of your fans (hours per day) in summer ……
8. How many fans do you use between 7PM and 11PM in summer ……
9. How many fans do you use between 11PM and 7AM in summer ……
10. How many fans do you use between 7AM and 7PM in summer ……

Interest in energy-efficient fans

11. Do you already own energy-efficient fans?
If yes, how many …….

If you do not own energy-efficient fans, why?
i. Not aware about efficient fans ii. Lack of information about the availability of efficient fans
iii. Uncertainty about the quality of these fans iv. High upfront cost
v. Other reasons ……..

12. With available information, would you be interested to replace your old fans with energy-efficient ones?
i. Yes ii. No

If yes, which option would you prefer?
i. Government's subsidy to cover part of the upfront cost. ii. Own money
iii. Instalment support for one or two years
If not, why? ……

Annexure 2: Sample size calculation

Due to the presence of large population in each income group, Cochran's formula is used to calculate sample size:

Sample size **n** = $Z^2 * p * q / e^2$ [38]

Here, Z is 1.645 for 90% confidence level

p = 0.5 (proportion of the population having the attribute of interest)

q = 1-p = 0.5 (proportion of the population without the attribute of interest)

e = margin of error (taken at 10%)

For each income group, the sample size **n** = (1.645 * 1.645 * 0.5 * 0.5)/(0.1 * 0.1) = **68**

The table below shows that the minimum requirement for sample size is fulfilled for each income group:

Income group (BDT/month)	Number of households surveyed	Minimum requirement
Up to 25,000	137	68
25,001–50,000	131	68
50,001–100,000	97	68
More than 100,000	70	68

Furthermore, the minimum sample requirements for fans for each income group is depicted below:

Income group (BDT/month)	Number of fans owned by sample households	Number of fans used in sample households	Minimum requirement
Up to 25,000	302	273	68
25,001–50,000	378	316	68
50,001–100,000	338	262	68
More than 100,000	359	241	68

Districts covered in survey (according to alphabetical order):

Bagerhat, Barisal, Bogra, Chattogram, Cumilla, Dhaka, Dinajpur, Faridpur, Gazipur, Jamalpur, Jashore, Khulna, Kishoreganj, Kurigram, Madaripur, Manikganj, Moulvibazar, Mymensingh, Pabna, Patuakhali, Rajshahi, Satkhira, Sherpur, Sylhet, Tangail, Thakurgaon.

[38] International Journal of Economics, Commerce and Management. Sampling Techniques & Determination of Sample Size in Applied Statistics Research: An Overview. Volume II, Issue 11. November 2014. Page 14.

Annexure 3: Calculation of household power and energy demand due to fans

Household numbers according to income group

Income group (BDT/month)	Total households (million)
Up to 25,000 (Category 1)	16.4
25,001–50,000 (Category 2)	8.2
50,001–100,000 (Category 3)	12.3
More than 100,000 (Category 4)	4.1
Note: Total households are 41 million; 5% is discounted from 43.1 million (see Table 1)	

Maximum evening power demand (between 7PM and 11PM but normally around 9PM) due to space cooling by fans (taking 10% margin of error) = $(P_1 + P_2 + P_3 + P_4) * 0.9$

Maximum power demand between 7PM and 11PM (around 9PM) for Category 1 households, P_1 = $n_1 * n_2$ * wattage of fan = 1,951.6MW
[where, n_1: number of households in category 1; n_2: number of fans used per household; wattage of an inefficient fan: 70W]

Maximum power demand between 7PM and 11PM (around 9PM) for Category 2 households, P_2 = 1,205.4MW

Maximum power demand between 7PM and 11PM (around 9PM) for Category 3 households, P_3 = 1,887MW

Maximum power demand between 7PM and 11PM (around 9PM) for Category 4 households, P_4 = 747.4MW

Maximum evening demand (between 7PM and 11PM, but normally around 9PM) due to space cooling by fans (taking 10% margin of error)[39] = 5,212MW

The same process is followed to estimate power demand during other periods of the day.

Annual energy demand due to fans (taking 10% margin of error)[40] $= (E_1 + E_2 + E_3 + E_4) * 0.9$

Annual energy demand of Category 1 households due to fans, E1
= $N_1 * N_2 * N_3 * N_4$ * wattage of fan = 4,556.4GWh
[where, N_1: number of households in Category 1; N_2: average number of fans used in a day; N_3: operational hours per day; N_4: operational days of a fan per year; wattage of an inefficient fan: 70W]

[39] While estimating demand, wattage of 1.4% energy-efficient fans is considered.
[40] The calculation assumes that households use fans for around nine months in a year, that is approximately 270 days a year

Energy demand of Category 2 households due to fan during a year, E2 = 2,984.9GWh
Energy demand of Category 3 households due to fan during a year, E3 = 5,789.6GWh
Energy demand of Category 4 households due to fan during a year, E4 = 2,131.5GWh

Total annual energy demand due to fans (taking 10% margin of error) = $(E_1 + E_2 + E_3 + E_4) * 0.9$ = **13,916GWh**

Annexure 4: Calculation of power- and energy-saving potential

Power saving potential

Power saving potential between 7PM and 11PM due to energy-efficient fans (taking a 10% margin of error) = (Ps_1 + Ps_2 + Ps_3 + Ps_4) * 0.9

Maximum power saving potential between 7PM and 11PM for Category 1 households, Ps_1
= n_1 * n_2 * difference in wattage if energy-efficient fans are purchased = n_1 * n_2 * (70-35) watts/fan[41]
= **975.8MW**
[where, n_1: number of households in category 1; n_2: number of fans used per household; wattage of an inefficient fan: 70W; wattage of an efficient fan: 35W]

Maximum power saving potential between 7PM and 11PM for Category 2 households, Ps_2
= **602.7MW**[42]

Maximum power saving potential between 7PM and 11PM for Category 3 households, Ps_3
=**939.9MW**[43]

Maximum power saving potential between 7PM and 11PM for Category 4 households, Ps_4
= **359.9MW**[44]

Power saving potential between 7PM and 11PM due to energy-efficient fans (taking a 10% margin of error) = (Ps_1+ Ps_2+ Ps_3+ Ps_4) * 0.9 = **2,590MW**

The same process is followed to estimate power saving potential during other periods of the day.

Energy saving potential

Energy saving potential in a year: (Es_1 + Es_2 + Es_3 + Es_4) * 0.9
Energy saving potential of Category 1 households in a year, Es_1 =
N_1 * N_2* N_3 * N_4 * difference in wattage due to energy-efficient fans = 2,278.2GWh
[where, N_1: number of households in category 1; N_2: average number of fans used in a day; N_3: operational hours per day; N_4: operational days of a fan per year; wattage of an inefficient fan: 70W; wattage of an efficient fan: 35W]

Energy saving potential of Category 2 households in a year, Es_2 = 1,492.46GWh

[41] These households do not use energy-efficient fans
[42] These households do not use energy-efficient fans
[43] In this category, 99.24% of fans are inefficient
[44] In this category, 92.9% of fans are inefficient

Energy saving potential of Category 3 households in a year, Es_3 = 2,883.7GWh

Energy saving potential of Category 4 households in a year, Es_4 = 1,026.5GWh

Annual energy saving potential due to efficient fans (taking 10% margin of error) = **(**$Es_1 + Es_2 + Es_3 + Es_4$) * 0.9 = **6,913GWh**

Annual cost saving potential = BDT89.87 billion (taking BDT13/kWh)

Annexure 5: Payback period calculation

Scenario 1:
Without any support

Income group: Up to BDT25,000/month
Cost of a BLDC fan: BDT5,000
Energy savings$_{10\text{ hours of operation per day}}$ = 35W * 10 hours * 30 days/month * 9 months/year
= 94.5kWh
Monetary savings$_{10\text{ hours of operation per day}}$ = Energy savings * tariff * Value added tax
= 94.5kWh * BDT5.26/kWh * 1.05 = BDT521.9[45]
Payback period$_{10\text{ hours of operation per day}}$ = 9.6 years

Energy savings$_{12.5\text{ hours of operation per day}}$ = 35W * 12.5 hours/day * 30 days/month * 9 months/year
= 118.125KWh
Monetary savings$_{12.5\text{ hours of operation per day}}$ = Energy savings * tariff * Value added tax
= 118.125kWh * BDT5.26/kWh * 1.05 = BDT652.4
Payback period$_{12.5\text{ hours of operation per day}}$ = 7.7 years

Scenario 2
Bulk procurement by the government
Cost of a BLDC fan: BDT3,750 (25% reduction)
Energy savings$_{10\text{ hours of operation per day}}$ = 94.5KWh
Monetary savings$_{10\text{ hours of operation per day}}$ = BDT521.9
Payback period$_{10\text{ hours of operation per day}}$ = 7.2 years
Energy savings$_{12.5\text{ hours of operation per day}}$ = 118.125KWh
Monetary savings$_{\textbf{12.5 hours of operation per day}}$ = BDT652.4
Payback period$_{12.5\text{ hours of operation per day}}$ = 5.7 years

Scenario 3
Carbon revenue is distributed
Cost of a BLDC fan: BDT3,150 (25% reduction due to bulk procurement and a carbon revenue of BDT600 per fan is offered)
Energy savings$_{10\text{ hours of operation per day}}$ = 94.5KWh
Monetary savings$_{10\text{ hours of operation per day}}$ = BDT521.9
Payback period$_{10\text{ hours of operation per day}}$ = 6 years
Energy savings$_{12.5\text{ hours of operation per day}}$ = 118.125KWh
Monetary savings$_{12.5\text{ hours of operation per day}}$ = BDT652.4
Payback period$_{12.5\text{ hours of operation per day}}$ = 4.8 years

[45] Includes 5% value added tax

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

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Acknowledgements

The author thanks Abdur Rahman (Sengua High School), Kazi Aowal (Orion Pharma Ltd.), Shakhawat Hossain (Square Pharmaceuticals PLC), Md. Mahmudul Hassan Khan (National Housing Finance PLC), and Shihabul Shakib (Sadharan Bima Corporation) for collecting household data through in-person surveys conducted in July and August 2026 using IEEFA's template. The author further acknowledges the contribution of Mehedi Hasan Sami (Primetech Solutions Ltd.), who prepared an online form for a virtual survey of households.

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