

DEMAND ANALYSIS FOR SMART GREEN ENERGY SOLUTIONS

A. Demand for SGES for Home Energy Efficiency Improvement

1. Tajikistan's total energy consumption bill in 2008 was about \$1 billion, which amounted to 22% of the country's GDP that year, one of the highest levels globally.¹ The deterioration in housing conditions and their energy inefficiency is due to lack of recent improvements in housing construction energy efficiency, and maintenance and repair. Since 1995, when the Law on Housing Privatization was approved, nearly 93% of the country's housing units have been privatized. With privatization, the responsibility of repair and maintenance was transferred from the government to private households, without providing access to finance for housing repairs and improvements.

2. Habitat for Humanity Tajikistan (HFHT), a housing service NGO, in partnership with two of Tajikistan's largest MFIs, IMON and Arvand, has provided loans to 6,000 households to rebuild as well as to renovate their homes using energy efficient smart green energy solutions (SGES) such as double glazed windows and thermal insulation for roofs and walls. This demonstrates that significant demand exists for SGES and credit for both existing and newly constructed houses.

3. The HFHT home improvement loan program was piloted in 2008 with IMON International as the MFI partner. IMON financed the entire cost of the pilot capital (\$1.2 million). As the pilot was successful, IMON incorporated housing microfinance into its loan products, and now has plans to scale-up this loan product. It has secured an additional \$2 million from the MicroBuild fund (an initiative of Habitat for Humanity International), and is planning on lending to an additional 2,000–4,000 clients per annum.²

B. Demand Survey for Solar SGES for Lighting and Water Heating

4. Over 97% of Tajikistan's population is connected to the electricity grid. However, availability of electricity is severely limited in rural areas. An estimated 24,000 households live in off-grid regions with no access to grid electricity. A household survey commissioned by ADB in April-May 2012³ collected data on energy demand, consumption patterns, expenditure, and their interest in purchasing smart green energy solutions (SGES) such as solar home solutions and water heaters. The results of this survey demonstrated significant demand for solar energy solutions for lighting and water heating in the areas surveyed. Less than 1% of the surveyed households currently use solar energy solutions. Lack of credit was cited as the most important reason for not being interested in purchasing these solutions, with lack of awareness being the second most important reason.

5. Table 1 provides a list of fossil and solid fuels that are used by surveyed households. Wood, candle, manure, coal and LPG gas were the most commonly used fossil and solid fuels for heating, cooking and lighting purposes. From this data, it can be inferred that an average

¹ UNDP. 2011. *Energy Efficiency Master Plan for Tajikistan: Energy Efficiency for Economic Development and Poverty Reduction*. Dushanbe.

² Katherine E. Knotts, Habitat for Humanity. 2012. *Challenges and opportunities in housing microfinance partnerships: The case of Habitat for Humanity Tajikistan and IMON LLC*. Dushanbe.

³ The survey sample was composed of 560 households, of which 100 families were off-grid. A random sample of 460 households consisted of 360 households connected to the grid and 100 households which are off-grid. In addition, a sample of 100 respondents was selected from existing MFI clients. The sample was drawn from 15 districts and 30 villages/communities spread across all 4 regions of Tajikistan.

rural household in Tajikistan uses a combination of fossil and solid fuels for its energy needs, depending on their availability.

Table 1: Household Usage of Fossil and Solid Fuels, Tajikistan, 2012

Fuel	Share of Surveyed Households using Type of Fuel
Wood	86%
Candle	78%
Manure	72%
Coal	59%
Gas (LPG)	49%
Diesel/gasoline	21%
Kerosene	5%
Others	11%

Source: ADB household survey, 2012.

6. Households surveyed appreciated the importance of improved energy supply. 71% of the surveyed households expressed that improved energy supply is very important. Better quality of living (93%) and education (80%) were cited as the main outcomes of improved energy supply.

7. Among the 560 households surveyed, 48% expressed interest in purchasing solar home solutions (for lighting and appliances) and solar water heaters. Of the households interested in purchasing solar solutions, 91% stated that they would need credit for this purpose. 65% of these households stated that they had enough income to pay for monthly loan installments, if they borrowed for purchasing solar solutions (Table 2).⁴ Hence, 31% of households surveyed are interested in purchasing solar solutions and have the income to repay the loan borrowed for this purpose.

Table 2: Household Interest in Purchasing Solar Energy Solutions and Income Level, Tajikistan, 2012

Item	Cost of Solar Energy Solutions (A)	Share of Surveyed Households (B)	Share of Column (B) that Require Credit	Share of Column (B) that Have Income to Repay Credit
Interested in buying one solar solution	\$200-450	24%	91%	65%
More than one solar solution	\$500-950	16%	91%	50%

Source: ADB household survey, 2012.

8. Among the households which did not want to purchase solar solutions, 46% cited 'lack of access to credit' as the reason (Table 3).

Table 3: Top 3 Reasons for Lack of Interest in Purchasing Solar Energy Solutions, Tajikistan, 2012

Reason	Percent
Lack of finance/credit for purchasing	46%
Not interested	14%
No information on equipment	12%

Source: ADB household survey, 2012.

⁴ The surveyed households were provided with the cost of solar solutions and the likely rate of interest on loans.

C. Demand Projections for Credit for SGES for Home Energy Efficiency Improvement

9. As mentioned earlier, a pilot program for home improvement micro-loans launched by Habitat for Humanity in partnership with IMON and Arvand disbursed 6,000 loans worth \$8.1 million in 2 years in 2011–12. Assuming that 3,000 of these were disbursed in 2012 and assuming a conservative demand growth rate of 10% every year, it is estimated that an aggregated demand of at least 25,000 new micro-loans for home improvement and energy efficiency in the country will be created in the 2013–2018 period (project implementation period).

10. If access to finance for home improvements⁵ is provided for the entire country and if it is assumed that 5% of the 500,000 houses that need renovation install smart green energy solutions (SGES) for energy efficiency improvements by borrowing an average of \$2,000, then the potential green finance credit demand for SGES is 25,000 households (in the same range as estimated above) borrowing a total of \$50 million. At the other end of the range, if it is optimistically assumed that 30% of the 500,000 houses install SGES for energy efficiency improvements by borrowing an average of \$2,000, the potential green finance credit demand for SGES is 150,000 households borrowing a total of \$300 million.

Table 4: Estimated Market Size for Energy Efficiency SGES, Tajikistan, 2012

Item	Number of Houses for SGES Installations	Average Loan Size	Green Finance Credit Demand
Potential Market Size (Conservative Estimate)	25,000 (5% of 500,000 that need renovation)	\$2,000	\$50 million
Potential Market Size (Optimistic Estimate)	150,000 (30% of 500,000 that need renovation)	\$2,000	\$300 million

Source: ADB staff estimates.

11. With lack of support from the government and more importantly, no long-term funds available from the banks or private lenders to finance repair and maintenance of these houses, housing improvement loans offered by IMON and Arvand in partnership with Habitat for Humanity has seen a large demand. Nevertheless, given that nearly 500,000 houses need immediate repair, this program has only served 1.2% of the potential market size in terms of number of homes that need renovation and 1–2% of the potential credit demand. This potential market size will be larger and the portion being served by the Habitat for Humanity program will be much smaller if potential credit demand from newly constructed houses is included.

D. Demand for Solar SGES for Lighting and Water Heating

12. **Solar SGES for Lighting:** There are an estimated 24,000 households living in off-grid areas in Tajikistan. Demand for solar SGES for lighting is expected to be mainly from these off-grid households. Extrapolating the demand data from the household survey to the off-grid population of Tajikistan, the potential market size for solar SGES for lighting is about 30% of the total number of off-grid households. This translates to a potential market size of 7,200 households. Assuming that the average loan size borrowed to purchase a solar SGES for lighting by these off-grid households is \$350 (average of \$200 solar SGES for lighting-only and \$500 solar SGES for lighting and TV), the potential green finance credit demand for solar SGES for lighting is \$2.52 million.

⁵ SGES for home improvement include energy efficient roofs, double-glazed windows, energy efficient doors, and wall and roof insulation. Cost of each of these individual solutions range from \$50-200 but for most households, many of these need to be bundled together.

13. **Solar SGES for Water Heating:** Unlike solar SGES for lighting, demand for solar SGES for water heating is likely to be evenly distributed across the country, particularly those living in rural areas of Tajikistan. Of the estimated 1 million households in Tajikistan, approximately 70% live in rural areas or in houses in urban areas that require energy efficiency improvements. If it is assumed that demand for solar SGES for water heating will be largely from these households, the primary target consumers for solar SGES for water heating are these 700,000 households.

14. Extrapolating the demand data from the household survey to the entire rural population of Tajikistan, the potential market size for solar solutions is about 30% of the total number of rural households. This translates to a potential market size of 210,000 households. Assuming that the average loan size borrowed to purchase a solar SGES for water heating by these households is \$300, the potential green finance credit demand for solar SGES for water heating is \$63 million.

Table 5: Estimated Market Size for Solar SGES, Tajikistan, 2013

Item	Number of Rural Households for Solar	Average Loan Size(\$)	Green Finance Credit Demand (\$)
Potential Market Size for Solar SGES for Lighting	7,200 (30% of 24,000 off-grid households)	350	2.52 million
Potential Market Size for Solar SGES for Water Heating	210,000 (30% of 700,000 rural households)	300	63 million

Source: ADB staff estimates.

E. SGES Suppliers in Tajikistan

15. The HFHT program, together with the GIZ Warm Comfort program, have generated demand for SGES in Tajikistan, thereby creating a small industry for manufacturing energy efficient home improvement SGES locally. The GIZ Warm Comfort program also created a cooperative of craftsmen in the Gorno-Badakhshan region, which assembles energy efficient windows, doors, and roofs locally by importing some components. The HFHT program has created demand for SGES produced by local workshops and craftsmen, thereby encouraging development.

16. Similarly, several donors and development agencies working in Tajikistan, such as World Bank, UNDP, and JICA, have initiated a few grant-based programs for installing solar home solutions and solar water heaters for homes, hospitals and other establishments in the country. These programs have been instrumental in creating a small but significant solar energy solution supplier industry. This supplier industry includes local Tajik companies such as JSC Sistemavtomatika, Toron Solar and Wind LLC and Nelt LLC. International companies such as Skorut Taj LLC (a Polish-Tajik joint venture) and Grundfos Central Asia (subsidiary of a Danish multinational company) also supply solar energy solutions in the country. Thus, an SGES supplier industry exists in Tajikistan to cater to the demand created by this project. The demand created will help develop this supplier industry further, thereby supporting private sector development.