ACCELERATING PROGRESS TOWARD FINANCIAL SUSTAINABILITY

Safe Water Network Ghana has a mission to demonstrate a model for providing decentralized safe water to peri-urban communities in Ghana that is reliable, affordable, and sustainable. This model can meet the demand of 1,000 communities in Ghana, impacting more than 3 million people. Our piped-connection service will move customers up the water services ladder (Figure 1) by providing safely managed water on household premises. Station by station, this model brings us closer to achieving United Nations Sustainability Development Goal 6 to “ensure availability and sustainable management of water and sanitation for all.”

OPTIMIZING STATIONS IS AN ONGOING PROCESS WITH SIGNIFICANT PAYOFF POTENTIAL. THE FINANCIAL AND SOCIAL SUCCESS OF DEPLOYING THESE INNOVATIVE SOLUTIONS DEMONSTRATES OUR TRAJECTORY TOWARD ACHIEVING THE SCALE GOAL OF REACHING 1,000 COMMUNITIES.

WATER SERVICES LADDER

In order to reach 1,000 communities, Safe Water Network Ghana is committed to optimizing station operations and financial viability while maximizing social impact. Since launching our first H2OME! water station in 2009, we have piloted innovations to improve the business proposition of our model, notably including:

- **PIPED CONNECTIONS:** Safe water connected directly to households, schools, clinics, and commercial businesses at an affordable price
- **PRE-PAID METERS:** Automated water dispensers, enabled with mobile money payments to provide customers with increased payment options and 24/7 access
- **SOLAR:** Alternate energy source that uses solar pumping to reduce electricity costs and increase station reliability
- **INTEGRATED DATA MANAGEMENT:** Streamlined collection, review, and reporting of data through integration of station technologies

SAFELY MANAGED
Water from an improved water source that is accessible on premises, available when needed and free from fecal and priority chemical contamination

BASIC SERVICES
Water from an improved source, provided collection time is not more than 30 minutes for a roundtrip including queuing

LIMITED
Water from an improved source for which collection time exceeds 30 minutes for a roundtrip including queuing

UNIMPROVED
Water from an unprotected dug well or unprotected spring

SURFACE WATER
Water directly from a river, dam, lake, pond, stream, canal or irrigation canal

SPOTLIGHT:

In order to reach 1,000 communities, Safe Water Network Ghana is committed to optimizing station operations and financial viability while maximizing social impact. Since launching our first H2OME! water station in 2009, we have piloted innovations to improve the business proposition of our model, notably including:

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- **SOLAR:** Alternate energy source that uses solar pumping to reduce electricity costs and increase station reliability
- **INTEGRATED DATA MANAGEMENT:** Streamlined collection, review, and reporting of data through integration of station technologies

Optimizing stations is an ongoing process with significant payoff potential. The financial and social success of deploying these innovative solutions demonstrates our trajectory toward achieving the scale goal of reaching 1,000 communities.
In parallel, we have advanced several training programs and performance management systems to equip our field teams with the tools, resources, and capabilities needed to ensure success, particularly in the areas of water quality assurance, operational reliability and financial stewardship. Currently, our 100 H2OME! stations in Ghana reach more than 450,000 individuals in over 140 communities across nine of the 16 regions in Ghana.

In 2020, Safe Water Network Ghana piloted the build-out of a new H2OME! station design called Optimized Piped Connection (OPC), which accommodates 500+ piped connections to households, schools, clinics and commercial businesses within a single community. Based on 18 months of operating data, we forecast that this approach can provide safely managed water while achieving positive cash flow after two to four years of operation. We plan to build 10 new OPC stations and retrofit 25 of our existing stations to OPC over five years. The performance of our four pilot stations demonstrates that this scale plan has the potential to break even in four years and generate $284K in surplus in Year 5 across a portfolio of 122 stations. At this pace, we would have a surplus of $1.8 million in 2031. Without the addition of OPC stations and other optimizations, our existing portfolio would require more than 15 years to break even.

The Optimized Piped Connection model will be critical to closing the sustainability gap. Incorporating other high-payoff operations such as pre-paid meters, solar, and integrated data management will also help us achieve financial sustainability. These optimizations provide an alternative to price increases, which we implement only to keep pace with inflation in order to ensure that water is affordable for those living on less than $2.50 per day. Together, these innovations will help our station portfolio to generate positive cash flow.

Anticipating a surplus of this magnitude, we are currently evaluating prioritization for managing the surplus to:

1. build capital reserves,
2. implement capital improvements for existing stations,
3. build new infrastructure, and
4. attract new financing opportunities.

To achieve our plan, we must catalyze more funding from government and development agencies. The government can assist by providing CapEx or operational subsidies, which are key to achieving financial sustainability while keeping water affordable. They are also instrumental in helping to secure funds from multi-lateral development agencies through direct involvement with implementation.

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1 The portion of operational expenses that is not covered by revenue
ACCELERATING PROGRESS TOWARD FINANCIAL SUSTAINABILITY

THE SUBSIDY GAP

Using our 2019 station financials, we quantified our portfolio's current subsidy gap. This analysis evaluated the capability of water station revenue to cover station operating expenses (station OpEx), sustainability costs and overhead allocations. Station OpEx includes day-to-day fixed and variable expenses for running stations. Sustainability costs include the Field Service Capability (FSC) and Maintenance Reserve (MR) requirement, while overhead allocations comprise the portion of expenses from our central Accra office that enable stations to run.

Our analysis shows that revenue can cover station OpEx and a portion of sustainability costs and will support 48% of these two cost categories, when combined. When overhead allocations are factored into the analysis, revenue can cover 33% of the total costs.

**FIGURE 2: Ghana Sustainability Dashboard Full-Year 2019 (USD)**

Stations are capable of fully covering station OpEx, although a $323K subsidy gap remains for sustainability costs, which increases to a $607K gap when overhead allocations are included.

CLOSING THE GAP AND ACHIEVING FINANCIAL SUSTAINABILITY

Safe Water Network Ghana tests innovations that can enhance the efficiency of our stations and provide better service to customers. We evaluate the impact of these optimizations through a classic profitability framework of increasing revenues and decreasing costs through distinct drivers (as shown in Exhibit 1).

To increase revenues, we have prioritized the expansion of piped connections, which leads to higher consumption, moving customers up the service ladder to safely managed water. We also direct resources to increase the number of users and the volume of water they consume at all stations. These activities achieve a double bottom line by increasing both financial and social returns. Improving collection efficiency through pre-paid meters is another high pay-off option for increasing revenue. In 2019, we lost $67K to inefficient collection.

To identify areas for cost savings, we applied rigorous financial tracking of each related category to determine the largest cost factors and areas for improvement (depicted in Exhibit 2). The majority of station OpEx (34%) is allocated to electricity costs with operator salaries and vendor commissions making up 21% and 20%, respectively. FSC expenses are largely comprised of staff, technology, and travel expenses. Our analysis of the financial requirement to replace station technology after parts expire revealed that LMS technology is the most cost-efficient option.

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2 We used 2019 financial data because the free water mandate took place in 2020 when small water implementers could not collect revenue.
3 Our Field Service Capability (FSC) maintains the stations and conducts community engagement activities, partially supported by monthly contributions from stations.
4 The Maintenance Reserve (MR) is used for repairs greater than 3,000 GHS and is partially supported by monthly contributions from stations.
OPTIMIZING STATIONS

To address these revenue and cost drivers, we have identified several areas for investment that will lead to overall efficiency gains and a reduction in the sustainability gap. These areas include piped connections, pre-paid meters, solar power, and integrated data management tools.

Piped Connections

In 2013, Safe Water Network Ghana expanded its service offering to include piped connections to households, schools, clinics, and commercial businesses. Using purchasing data from 2019, we found that piped-connection customers purchased roughly four times more water than standpipe customers (198 GHS to 44 GHS per annum). A lifetime value analysis of both customer types showed that piped-connection customers spend 10 times more (2,100 GHS to 210 GHS). This analysis indicates that effective household connections have the potential to increase both financial sustainability and liters per capita per day (LPCD).

While our LMS Optimized stations are equipped to service up to 50 piped connections each, we had only 907 connections across 57 stations in 2019. To expand our piped-connection service, Safe Water Network Ghana identified the need to invest in a dedicated sales team. In addition, we wanted to address customer frustrations with connection pricing. Most often, these issues were related to pricing adjustments that deviated from the original estimates due to unforeseen environmental obstacles. Moreover, first adopters often bore the bulk of the financial burden by paying for the full extension of the pipeline to their household, whereas later adopters could then connect their pipe to the extension already in place.

In response to these challenges, Safe Water Network Ghana designed an Optimized Piped Connection (OPC) station that could service more than 500 households with connection points throughout the community, enabling all customers to pay a lower price for connections to their homes. We developed a dedicated sales team and a sales tracking app that uses GIS technology to provide a real-time cost estimate of the connection with enhanced accuracy. Since 2020, we have piloted four OPC stations; one is newly built, while the other three are retrofits of our existing stations.

These stations have performed well in the first year of operation. Based on our existing data, we project that the new OPC stations will cover the full sustainability costs per station by Year 2. For retrofits, stations reach this break-even point in Year 4. When comparing new OPC stations to LMS Optimized, OPC stations have a lower unit cost of production and a higher unit margin of production. The same can be said for comparing retrofitted stations to the performance of a typical vintage station. Notably, while OPC retrofits have a slightly higher unit cost of production than LMS Optimized, the unit margin is higher in Years 4 and 5. This is because these models have a similar proportion of costs and revenue, but ultimately OPC stations are producing more revenue overall. As such, OPC retrofits contribute more to closing the sustainability gap at a portfolio level.

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5 LMS Optimized stations are built with 6-7 community standpipes, which use automatic water dispenser or pre-paid meter technology. They serve up to 50 piped connections, utilize solar energy, and operate with LMS technology since it is the least expensive to replace and the easiest for operators to use.
When we compare the break-even point to cover sustainability costs in Figure 4, we again see the advantage of new and retrofitted OPC stations. In addition to covering sustainability costs sooner, OPC stations are capable of generating substantially more revenue. OPC retrofits start off with a lower margin than LMS stations due to high up-front sales expenses. However, the OPC retrofit model surpasses LMS in Year 3 and covers sustainability costs.

**FIGURE 3:** Unit Cost of Production and Unit Margin of Production (USD)

<table>
<thead>
<tr>
<th>Year</th>
<th>Unit Cost of Production</th>
<th>Unit Margin of Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OPC (New)</td>
<td>LMS Optimized</td>
</tr>
<tr>
<td>1</td>
<td>2.5</td>
<td>0.7</td>
</tr>
<tr>
<td>2</td>
<td>1.7</td>
<td>0.8</td>
</tr>
<tr>
<td>3</td>
<td>1.5</td>
<td>0.6</td>
</tr>
<tr>
<td>4</td>
<td>1.3</td>
<td>0.4</td>
</tr>
<tr>
<td>5</td>
<td>1.2</td>
<td>0.6</td>
</tr>
</tbody>
</table>

^6 Based on the average of our existing portfolio

Our scale plan is to build three new LMS stations, two new OPC stations, and retrofit five OPC stations per year. This plan will increase the total number of stations to 122 in Year 5 and allow our portfolio to cover full sustainability costs by Year 4. By Year 6, we expect to fully cover overhead allocations and increase general capital reserves while generating a surplus of $284K. In addition, communities will receive a portion of revenues as a community dividend.
Pre-Paid Meters

While pre-paid meters are used for piped connections, they may also be placed at community standpipes. These machines are designed to be operated by a vendor or by customers using an RFID card that facilitates transactions through mobile money. Customer-operated pre-paid meters allow customers to:

1) keep track of their balances,
2) access standpipes 24/7,
3) eliminate cash requirements, and
4) plan ahead by topping up for future use.

These machines improve collection efficiency to 100%. In addition, they have the capability of providing digitized data through detailed reports.

Pre-paid meters enable an improved pricing strategy that keeps pace with inflation, making it more manageable for low-income customers. With coinage, we can only increase prices in .05 pesewa increments whereas digital payments allow increases in .01 pesewa increments. The .01 increment aligns with yearly inflation, minimizing the financial shock for price-conscious customers.

Currently, 26 of 102 stations use pre-paid meters. By the end of Year 5 in our scale plan, we will roll out these machines to community standpipes at all of our non-OPC stations (n=83).

Solar Power

Solar power has the potential to reduce the cost of electricity and increase reliability for stations that have an inconsistent power supply. Our data shows that solar power can reduce electricity costs per 1 liter of water by 35%. Sixty-three of our stations currently use solar power, and we plan to roll out this optimization to all stations by Year 2 of our scale-up plan.

Integrated Data Management Tools

In piloting these optimizations, we collaborated with a variety of skilled technology suppliers. Hence, much of our financial and operational data was collected and aggregated on different platforms, requiring manual data input from our field officers. Such input is time consuming and detracts from other important areas of focus, such as water quality and community engagement.

We are currently working with a developer to create an integrated data management platform that collects data from all our station technologies and aggregates it in one platform. This system will utilize automated data validation to streamline the review process. By enabling us to set alerts and pop-ups that keep data collection and reviews on track, the integrated platform can be used as a digital assistant to field officers for other activities. It uses advanced analytics, dashboards, and reporting to deepen our understanding of station operations and drive the organization to improve service delivery. This system is in the pilot stage and will be ready for full release in 2022.

Each of these optimizations addresses major revenue and cost drivers (as outlined in Exhibit 3). We have incorporated the optimizations with the highest gains into our five-year scale plan. Projected performance of stations with these optimizations gives us confidence in closing the sustainability gap and reaching financial sustainability.
CLOSING THE SUSTAINABILITY GAP

Our five-year scale plan includes the addition of 15 LMS Optimized stations, 10 OPC stations and the retrofit of 25 existing stations to OPC. In addition, we will expand the piped-connection service at existing and LMS Optimized stations. Finally, we will roll out pre-paid meters, solar, and integrated data management to all stations. These optimizations will make numerous contributions toward station performance and service delivery (as summarized in Exhibit 4).

The modeling for our five-year projections predicts that we could cover full sustainability costs by Year 4 and overhead allocations by Year 5 with a surplus of $284K. In Year 10, we would have a $1.8 million surplus, which can then be reinvested for future retrofits and other optimizations.

![FIGURE 5: Projected Sustainability Gap for Year 5 and Year 10 (USD, '000)](chart)

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Revenue</th>
<th>Under Collection</th>
<th>Station OpEx</th>
<th>FSC Expenses</th>
<th>MR Requirement</th>
<th>Overhead Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>67</td>
<td>296</td>
<td>200</td>
<td>355</td>
<td>102</td>
<td>284</td>
</tr>
<tr>
<td>2026</td>
<td>87</td>
<td>1,526</td>
<td>534</td>
<td>443</td>
<td>145</td>
<td>134</td>
</tr>
<tr>
<td>2031</td>
<td>61</td>
<td>3,242</td>
<td>730</td>
<td>370</td>
<td>155</td>
<td>166</td>
</tr>
</tbody>
</table>

The modeling for our five-year projections predicts that we could cover full sustainability costs by Year 4 and overhead allocations by Year 5 with a surplus of $284K. In Year 10, we would have a $1.8 million surplus, which can then be reinvested for future retrofits and other optimizations.
NEXT STEPS

Our mission is to demonstrate an affordable, sustainable model that can be scaled and replicated to 1,000 communities across Ghana. Together with other implementers, we can achieve this goal by reaching financial sustainability, developing financing and governing structures, and refining implementation strategies. To achieve this ambitious plan, we must catalyze funding beyond philanthropic sources. We look to the Government of Ghana as a partner to help attract or provide funding to improve the decentralized water supply in Ghana. Some of the specific activities that will help us work toward this partnership include:

- Participation in research to develop delivery mechanisms for subsidies and quantify the costs and impact of subsidies on small water enterprises. We will share our findings with the Government of Ghana and engage with them on pricing subsidy policy
- Continued engagement with local governments and authorities for CapEx subsidies that address new construction
- Further exploration of the use of debt financing for small water enterprises to build on previous pilots with loan financing for small water enterprises
- Testing the hypothesis of our scale-up plan and re-evaluating its impact and potential year by year
- Expanding on work from Structuring for Growth and Sustainability Spotlight (March, 2018) to develop financing and governing structures for sound implementation and scale.

ABOUT SAFE WATER NETWORK

At Safe Water Network, we believe in a collaborative, innovative response to the global water crisis. We envision a world with healthy, thriving communities, each managing its own sustainable supply of safe water. Our mission is to develop and demonstrate affordable, economically viable solutions, share sector knowledge, and build partnerships that reach millions in underserved communities.
EXHIBIT 1: FRAMEWORK FOR IMPROVING FINANCIAL SUSTAINABILITY – GHANA

Financial Sustainability
(Reduce Sustainability Gap)

1. Increase Revenue

1A Grow Customer Base
1A1 Increase Number of Customers
1A2 Expand Service Area

1B Increase Sales Volume Per Customer
1B1 Increase Per HH Consumption
1B2 Grow Piped Connection Customers

1C Increase Revenue Per Sales Volume
1C1 Maintain Inflation-Adjusted Pricing
1C2 Increase Collection Efficiency

2. Reduce Costs

2A Improve Station OpEx Efficiency
2A1 Further Reduce Electric Costs w/ Solar
2A2 Reduce Vendor Commissions

2B Improve FSC Cost Per Station
2B1 Enhance FSC Productivity w/ Technology
2B2 Improve Team Retention, Field Training

2C Improve Data Management, Inefficiency
2C1 Introduce Remote Data Capture/Monitor
2C2 Integrate, Streamline Data Mgmt, Reporting

= Areas of High Potential Impact
EXHIBIT 2: COST DRIVERS – TOP CATEGORIES (GHANA 2019)

Percent of Total Costs (Station OpEx, Field Service Capability), 15-Yr Maintenance Reserve Req.

<table>
<thead>
<tr>
<th>Station Operating Expenses</th>
<th>FSC + Sales Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>34%</td>
</tr>
<tr>
<td>Operator Salaries</td>
<td>21%</td>
</tr>
<tr>
<td>Vendor Commissions</td>
<td>20%</td>
</tr>
<tr>
<td>Lab Tests</td>
<td>8%</td>
</tr>
<tr>
<td>Repairs</td>
<td>6%</td>
</tr>
<tr>
<td>Staff</td>
<td>57%</td>
</tr>
<tr>
<td>Vehicles and Travel</td>
<td>25%</td>
</tr>
<tr>
<td>Technology</td>
<td>8%</td>
</tr>
</tbody>
</table>

EXHIBIT 3: OPTIMIZATIONS IN THE PROFITABILITY FRAMEWORK

<table>
<thead>
<tr>
<th>Profitability Framework Reference</th>
<th>1A1</th>
<th>1B1</th>
<th>1B2</th>
<th>1C1 &amp; 1C2</th>
<th>2A</th>
<th>2B1 &amp; 2C2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increase Number of Customers</td>
<td>Increase per HH Consumption</td>
<td>Increase Piped-Connection Customers</td>
<td>Increase Collection Efficiency</td>
<td>Improve Station OpEx Efficiency</td>
<td>Enhance FSC Productivity</td>
</tr>
<tr>
<td>New OPC Stations</td>
<td>Substantial Gains</td>
<td>High Gains</td>
<td>Substantial Gains</td>
<td>High Gains</td>
<td>High Gains</td>
<td>Moderate Gains</td>
</tr>
<tr>
<td>Retrofit OPC Stations</td>
<td>High Gains</td>
<td>Substantial Gains</td>
<td>High Gains</td>
<td>Substantial Gains</td>
<td>High Gains</td>
<td>Moderate Gains</td>
</tr>
<tr>
<td>Pre-paid meters at community standpipes</td>
<td>High Gains</td>
<td>High Gains</td>
<td>Moderate Gains</td>
<td>High Gains</td>
<td>High Gains</td>
<td>Moderate Gains</td>
</tr>
<tr>
<td>Pipe connections at LMS Optimized stations</td>
<td>High Gains</td>
<td>High Gains</td>
<td>Moderate Gains</td>
<td>High Gains</td>
<td>High Gains</td>
<td>Moderate Gains</td>
</tr>
<tr>
<td>Integrated digital operating platform</td>
<td>Moderate Gains</td>
<td>Substantial Gains</td>
<td>Moderate Gains</td>
<td>High Gains</td>
<td>High Gains</td>
<td>Moderate Gains</td>
</tr>
<tr>
<td>Solar power at stations</td>
<td>Moderate Gains</td>
<td>Substantial Gains</td>
<td>Moderate Gains</td>
<td>High Gains</td>
<td>High Gains</td>
<td>Moderate Gains</td>
</tr>
</tbody>
</table>

EXHIBIT 2B: COST DRIVERS – TOP CATEGORIES (GHANA 2019)

Maintenance Reserve 15-Yr Requirement

- UV: $44,062
- MSSF: $24,331
- LMS: $18,514
## EXHIBIT 4: FIVE-YEAR SCALE-UP PLAN

<table>
<thead>
<tr>
<th>Number of Stations with Optimizations</th>
<th>Contribution to Performance Improvement</th>
<th>Five-Year Scale-Up Plan</th>
</tr>
</thead>
</table>
| **Optimized Piped Connection**       | - Makes pricing for piped connections equitable  
                                         - Increases financial sustainability of station  
                                         - Increases consumption, convenience  
                                         - Improves collection efficiency | Build new OPC stations  
                                          Retrofit existing stations to OPC  
                                          Build out sales team and capabilities |
| 4                                   | 39                                       |                         |
|                                      | 62                                       |                         |
| **LMS Stations with Piped Connections** | Increasing convenience and consumption  
                                           Significantly improving collection rates (including arrears recovery), reducing non-revenue water | Increase sales activity at existing stations to increase number of piped connections  
                                           Maximize number of piped connections at traditional stations |
| 66                                   | 83                                       |                         |
|                                      | 75                                       |                         |
| **Pre-paid Meters at Community Standpipes** | Improves collection efficiency to 95%  
                                           Reducing vendor commissions by more than a third on average  
                                           Helping with convenience, data integrity | Increase sales activity at existing stations to increase number of piped connections  
                                           Maximize number of piped connections at traditional stations |
| 26                                   | 83                                       |                         |
|                                      | 75                                       |                         |
| **Solar Pumping**                    | Helping some stations to reduce electricity costs, but not all  
                                         Some issues with repairs, pumping at sub-optimal times, mud on panels, etc. | Roll out solar power to all stations |
| 63                                   | 122                                      |                         |
|                                      | 137                                      |                         |

2020  2026  2031