

CLEAN WATER SAVES LIVES

New Technology Transforms

Water Infrastructure to Save Lives & Lower Costs

Flextronics International (NASDAQ:FLEX), one of the world's largest electronics manufacturers, successfully created an *atmospheric water generation device* capable of producing inexpensive, abundant volumes of potable and medical-grade water. The technology consumes 70% less energy than any comparable device, is flexible to operate entirely off-grid using solar power, or on-grid using traditional power sources, and has zero fouling. The Water Generator is a pipe-less water infrastructure - an appliance enabling water to be created on-demand and on-location.

The total lives saved by the Water Generating technology is estimated to be 3.2 million per year at present, and up to 5 million per year as the situation worsens. For example, with 2 million people dying annually of dehydration (75% or 1.5 million of which are children), the placement of the Water Generators could drop child mortality by 11%¹, saving 165,000 children annually. And, with 3.6 million people dying from water related diseases annually and the 41% reduction in root cause (diarrhea) by having clean water placed within a 15 minutes' walk², such as the Water Generators, would result in 1,476,000 total lives saved annually.

Economically, the Water Generators can create potable solar-produced water on-location and on-demand for \$0.08/gal – far less than the health costs associated with having no potable water available – and sterile medical grade water for \$0.23/gallon a savings of at least 88% over existing supply.

A Non-Political Water Solution

Historically, large-scale water solutions have required governmental approval. SunToWater devices circumvent this political element, enabling each residence, business, hospital or field clinic to purchase, install and operate the device like any other appliance, similar to a refrigerator or dishwasher, not requiring government approval. The result is a localized solution that creates a secure and independent water supply, while eliminating politicians' power to "turn off the water" or financially benefit from production. The devices are also expected to reduce cross-border conflicts over water rights, an area expected to grow as water scarcity worsens.

¹ <http://engineering.stanford.edu/news/sub-saharan-africa-shorter-walk-water-saves-lives>

² <http://engineering.stanford.edu/news/sub-saharan-africa-shorter-walk-water-saves-lives>

The Water Generator

The new desiccant-based atmospheric water generator is robust in its applications.

- **Quantity:** The unit is capable of producing 40 gallons of distilled water per day on solar power in African desert conditions and up to double that quantity if plugged into traditional power sources.
- **Quality:** The water generated is fit for agricultural use immediately, can be easily remineralized to produce WHO standard drinking water, and can be filtered to produce sterile medical-grade ultra-pure water for hospitals and field clinics.
- **Cost:** The device produces WHO-standard water at a \$0.08/gal price for solar produced potable water and \$0.23/gal for solar produced sterile medical-grade water.
- **Usage:** The units have an ultra-simple design and require no special training to use or operate.
- **Size & Storage:** The unit has the footprint of a refrigerator and creates water that can be stored in standard tanks or location appropriate containers. UV treatment on stored water could be used to eliminate contaminants accumulated from prolonged storage.
- **Maintenance:** The unit requires minimal maintenance (e.g. wiping dust off solar panels).
- **10-Year Warranty:** The manufacturer provides a 10-year warranty on each unit they manufacture.
- **Environmental Impact:** The unit's only byproducts are water and dehumidified air with no observed or foreseeable impacts on the ecosystem or atmosphere.
- **Target Markets:** The technology addresses both "water scarce" and "water contaminated" regions with specific focus on Africa and East Asia.

Clean Water Saves Lives

Every year, unsafe water, coupled with a lack of basic sanitation, kills at least 1.6 million children under the age of five years³. We aim to address this problem head on.

The Water Generator is expected to save in excess of 1.8 million lives per year through the creation of: (1) **Medical-grade water** for health facilities in Africa, increasing effective medical treatments and reducing the spread of disease; (2) **Potable water** available upon demand and on location, combating the 2 million annual dehydration deaths; and (3) **Agricultural water** increasing local food and grain production by up to 5%.

³ http://www.who.int/water_sanitation_health/monitoring/jmpfinal.pdf

Additionally, the Water Generating units will significantly improve an additional estimated 100 million lives through creating: (1) **Positive economic impact**, advancing the estimated annual \$60 billion economic benefit from meeting the water supply and sanitation targets, and (2) **Positive educational impact**, reducing the 433 million school days lost to children fetching or drinking contaminated water.

Countries Without Water

The following ten countries are home to two-thirds of the global population without access to improved drinking water sources: **China** (108 million), **India** (99 million), **Nigeria** (63 million), **Ethiopia** (43 million), **Indonesia** (39 million), **Congo** (37 million), **Bangladesh** (26 million), **Tanzania** (22 million), **Pakistan** (16 million), **Kenya** (16 million).⁴ These ten countries total 469 million people.

Water for Medical Clinics

While some medical facilities throughout Africa are in urban centers and are “on-the-grid,” many are entirely “off-grid.” *Global Good* referenced 186,000 “help posts” that provide medical services in rural off-grid environments and all of these facilities require three types of water: (1) **Ultra-pure water** for surgery, IV fluids, hydrotherapies and other medical procedures; (2) **Potable water** to combat patient dehydration, the largest cause of death among children 5 and under; and (3) **Sanitation water** for hand washing and flushing toilets.

Ultrapure Water for Medical Clinics in Africa

Presently, ultrapure sterile water is not available at the vast majority of rural African medical clinics and help posts. Kenya, for example, has 160 hospitals for its nearly 40 million people, an average of 3.5 million people for each hospital. **Two-thirds of its hospitals are in desperate condition.** Many do not have running water. **Water is sometimes brought in by the bucket, often unclean and untreated.**⁵

The medical-grade water that is available faces significant delivery and storage challenges, resulting in high costs and inventory loss due to contamination. In the United States, the cost for medical grade water can range from \$2.00/gal up to \$18.00/gal. The Water Generators can produce this medical grade water for \$0.23/gallon – a savings of at least 88%.

Hydrotherapy - According to the CDC⁶, patients with medical conditions, such as burns, septic ulcers, lesions, amputations, and arthritis, can benefit from the effects of sitting in warm water. For the health and safety of patients, it is vital to ensure that the water is sterile. Many of these patients have compromised immune systems due to infections and are highly susceptible to new infections from contaminated water in hydrotherapy pools. Potential infection is caused by contaminated water ingestion, breathing sprays and aerosols from the water, and allowing wounds to come in direct contact with the water. The ability to create sterile water for clinics on-location and on-demand with the Water Generator will address this need.

Hemodialysis - Medical grade water is needed for hemodialysis. For the health and safety of hemodialysis patients, it is vital to ensure that the water used to make the dialysate is safe and clean. According to the CDC⁷, hemodialysis requires special water-treatment processes to prevent adverse patient outcomes of dialysis therapy resulting from improper formulation of dialysate with water containing high levels of certain chemical or biological contaminants. The Water Generator addresses this need.

Endoscopies - Medical grade water is needed for endoscopies, a medical procedure examining the interior surfaces of the body. According to the CDC⁸, the optimal rinse fluid for this device is sterile water; however, sterile water is expensive and difficult to produce in sufficient quantities. The Water Generator addresses this need.

Dental procedures and dental surgeries - Medical grade water is needed for dentistry. According to the CDC⁹, water lines that feed many dental units deliver water during general, non-surgical and surgical procedures. In the non-developed countries, municipal tap water may be contaminated and would be unsuitable for surgical use. The Water Generator addresses this need.

Assuming, 186,000 field hospitals¹⁰ with an average of 1,000 patients per year and only a 1% death rate due to infection from non-sterile water or contaminated equipment during surgery or medical procedures, the Water Generator could save up to 1.86 million lives annually¹¹.

⁶ <http://www.cdc.gov/healthywater/other/medical/hydrotherapy.html>

⁷ <http://www.cdc.gov/healthywater/other/medical/hemodialysis.html>

⁸ http://www.cdc.gov/healthywater/other/medical/med_dental.html

⁹ http://www.cdc.gov/healthywater/other/medical/med_dental.html

¹⁰ Maurizio Verchionne - *Global Good*

¹¹ 186,000 help posts x 1000 visits/yr/post x 1% lives saved = 1,860,000

⁴ http://www.unicef.org/media/media_45481.html

⁵ http://www.onewater.org/stories/story/africas_deadly_hospitals

Potable Water for Medical Clinics in Africa

Lack of clean drinking water is a critical medical issue. Today, 345 million live without water access in Africa and 3.4 million die annually from water-related diseases. The water and sanitation crisis claims more lives than any war and children are effected the worst. Every 21 seconds, a child 5 or under dies from a water related disease – 4,000 child deaths a day. Diarrhea, dysentery, typhoid and cholera all cause death by dehydration. **More than half of the hospital beds in developing countries are taken by people suffering from water related diseases.**¹²

Diarrhea occurs world-wide and causes 4% of all deaths and 5% of health loss to disability. It kills around 2.2 million people globally each year, mostly children in developing countries.¹³ The average African family needs only 5 gallons per day¹⁴ and when it cannot secure it, disease, dehydration and death follow.

The Water Generator's ability to create abundant WHO standard drinking water even from polluted and arid air, using only solar power, which can be further enhanced with medical cartridges (e.g. adding electrolytes for rapid hydration treatments, etc.) **could save at least hundreds of thousands of lives today, and millions in the future as the water crisis worsens.**

In the short term, assuming only 10% of the 2.2 million who die annually due to dehydration receive the needed water from SunToWater, the devices could save up to a total of 220,000 lives annually¹⁵. This number is expected to grow to 50% or 1.1 million lives saved over time.

Sanitation Water for Medical Clinics in Africa

African medical facilities and clinics that lack clean water show a higher incident of disease transmission. Assuming 186,000 African clinics, 30% having sanitation facilities, each serving only 1,000 patients per year with only 1% of those patients dying from infections due to lack clean water for proper sanitation, a total of 558,000 lives¹⁶ could be saved by the introduction of devices that can create clean water for sanitation on-location and on-demand, a number expected to double to over 1 million lives as the problem worsens.

¹² Water.org

¹³ http://www.who.int/water_sanitation_health/diseases/diarrhoea/en/

¹⁴ <http://www.slideshare.net/mobile/PeterAshworth/wells-of-life-africa>

¹⁵ $2,200,000 \times 10\% = 220,000$

¹⁶ $186,000 \times 30\% \times 1000 \times 1\% = 558,000$

Clean Water for Dentistry

Disease transmission from patient to patient is significant in Africa and India due to scarce availability of medical grade or even potable water for dental procedures and proper equipment cleaning. In many African territories, there are fewer than 1 dentist to every 100,000 people.¹⁷ Assuming African population at 1.1 billion and 1 dentist per 100,000 people, a total of 11,000 dentists practice in Africa. Assuming each dentist sees conservatively 1,250 patients per year (5/day, 250 days/yr), total dental patients seen is 13.75 million. If the Water Generators save only 1% of them from becoming critically ill or dying from infection or disease transmission, 137,500 lives¹⁸ would be saved, which will likely triple to 412,000 lives as the water scarcity increases.

Water for Combatting Disease Outbreaks

Cholera¹⁹

Cholera is a major public health problem for developing countries associated with poverty and poor sanitation. It can kill healthy adults within hours. The disease causes profuse watery diarrhea that leads to rapid dehydration and, if not treated, will result in death. **It is almost always transmitted by water or food that has been contaminated by human waste.** Surface water and water from shallow wells are common sources of infection, where bathing or rinsing cooking utensils in contaminated water can transmit the disease. **Prevention of cholera mostly consists of providing clean water and proper sanitation** to populations who do not yet have access to basic services. **Rapid rehydration** is the main intervention for treating cholera cases, either orally for moderate cases, or **intravenously** for severe cases, **requiring sterile water.** The Water Generator addresses this need.

According to the WHO, cholera represents up to 4.3 million cases, and up to 142,000 deaths per year worldwide, with 43% of the 2013 cases in Africa.²⁰ Assuming a conservative 100,000 global cholera-related deaths, 43% from Africa and the ability to provide potable water for rehydration as well as medical grade water for IV fluids to 10% of the infected community, the Water Generator could save up to 6,450 lives from cholera annually²¹. The number of lives that would be saved by providing **clean water for sanitation to stop the spread of cholera** is estimated to be 20 times this number or 129,000 lives saved through cholera prevention, numbers which are likely to triple as water scarcity increases.

¹⁷ <http://www.worldmapper.org/display.php?selected=218>

¹⁸ $186,000 \times 30\% \times 1000 \times 1\% = 558,000$

¹⁹ <http://www.who.int/cholera/en/>

²⁰ http://www.who.int/gho/epidemic_diseases/cholera/cases_text/en/

²¹ $100,000 \times 43\% \times 15\% = 6,450$

Malaria

According to the WHO²², 1.2 million people die of malaria each year, 90% of whom are children under 5. There are 396 million episodes of malaria every year, with most of the disease burden in Africa, south of the Sahara. Intensified irrigation, dams and other water related projects contribute importantly to this disease burden. **Better management of water resources reduces transmission of malaria and other vector-borne diseases.** The Water Generator addresses this need and if the technology saves only 1% from becoming critically ill or dying, 120,000 lives²³ would be saved from malaria.

Ebola

Ebola causes severe dehydration and, unless patients are provided with clean water, their immune systems are not able to fight the virus. Unfortunately, most of West Africa already suffers from a lack of clean water supplies which makes it very difficult for relief personnel to treat victims. Contaminated water sources put further strain on a patient's immune system²⁴. **Providing medical grade water to victims in remote locations will have a significant impact on the spread of the disease.**²⁵ Additionally, the WHO has said that hand hygiene is critical to preventing the spread of Ebola. Alcohol-based hand rubs or soap with running water are recommended.²⁶ The Water Generator addresses this need. This number is difficult to quantify but a compelling case can be made that the number is likely larger than 100,000 people per year or per outbreak.

Impact of Increasing Agricultural Water

The World Economic Forum studies that suggest that **water scarcity reduces grain production by as much as 30%.**²⁷ An increase in local agricultural water will:

- ✓ Increase fruit and grain production,
- ✓ Reduce prices of fruits and grains, and
- ✓ Reduce residual or secondary illness resulting from malnutrition.

Malnutrition and under-nutrition magnifies the effect of every disease, including measles and malaria. The estimated proportions of deaths in which under-nutrition is an underlying cause are roughly similar for diarrhea (61%), malaria (57%), pneumonia (52%), and measles (45%).

²² http://www.who.int/water_sanitation_health/publications/factsfigures04/en/

²³ 1.2 million malaria deaths x 1% saved = 120,000

²⁴ <http://www.npr.org/blogs/goatsandsoda/2014/07/10/330133944/ebola-101-the-facts-behind-a-frightening-virus>

²⁵ <http://www.newvisionafrica.org/urgent.ebola.outbreak.html>

²⁶ <http://www.who.int/csr/disease/ebola/faq-ebola/en/>

²⁷ <http://reports.weforum.org/global-risks-2014/part-1-global-risks-2014-understanding-systemic-risks-in-a-changing-global-environment/>

Increasing agricultural water also: (1) Increases employment, (2) Reduces crime, (3) Enhances overall productivity for children and adults, and (4) Combats increasing global food demand, which is expected to increase 40% by 2030 and double by 2050, meaning that a **70% increase in production output would be needed to feed the world.**²⁸

The number of hungry people in Africa is now estimated at 239 million and, in sub-Saharan Africa, is rising by 2% per year.²⁹ The life-saving impact of increasing agricultural water can only be estimated broadly. Addressing **less than half of one percent** of the hungry through increased grain and food production would save at least 100,000 lives annually.

TOTAL LIVES SAVED

The total lives saved by the Water Generating technology is estimated to be 3.2 million per year at present and up to 5 million per year as the situation worsens.

	Annual Lives Saved at Present	Annual Lives Saved as Situation Worsens
Ultra-Pure Water to Clinics	1,860,000	1,860,000
Potable Water to Clinics	220,000	1,100,000
Sanitation Water to Clinics	558,000	1,000,000
Sterile & Potable Water to Dentists	137,500	412,500
Cholera patients saved	6,450	19,350
Cholera deaths prevented	129,000	387,000
Malaria deaths prevented	120,000	120,000
Ebola deaths prevented	100,000	100,000
Increased Food Production	100,000	100,000
TOTAL ANNUAL LIVES SAVED	3,230,950	5,098,850

Calculated another way, we can look at the impact of making potable water available anywhere. Unicef reports that "Contamination of drinking water with naturally-occurring arsenic or fluoride, threatens the health of tens of millions of people."³⁰ Stanford University performed a study which found that cutting the walking time to a water source by just 15 minutes can reduce the under-five mortality rate of children by 11%, and slash the prevalence of nutrition-depleting diarrhea by 41%.³¹

With 2 million people dying annually of dehydration (75% of which are children), Water Generators could drop child mortality by 11%, saving 165,000 children annually.

With 3.6 million people dying from water related diseases annually and the ability to reduce the root cause (diarrhea) by 41% by placing a clean water source placed within a 15 minutes' walk, the Water Generators can result in 1,476,000 total lives saved annually.

²⁸ Source: Thomson Reuters Foundation, BofA Merrill Lynch Global research

²⁹ <http://www.worldhunger.org/articles/Learn/world%20hunger%20facts%202002.html>

³⁰ http://www.unicef.org/wash/index_water_quality.html

³¹ <http://engineering.stanford.edu/news/sub-saharan-africa-shorter-walk-water-saves-lives>

Significant Economic Impact

In addition to saving lives, the Water Generating technology:

1. **Helps Combat Economic Loss** - Poor water and sanitation result in economic losses estimated at US\$260 billion annually in developing countries, or 1.5% of their GDP.³²
2. **Helps Meet Water Targets** - The benefits from meeting the water supply and sanitation MDG targets combined equal over US\$60 billion annually.
3. **Frees time for more productive pursuits** - The main contributor to overall benefits of drinking-water systems is the value of time savings which accounts for almost 70% of total benefits in all regions. In Africa alone, people spend 40 billion hours every year just walking to collect water.³³ Water Generators allow for this time to be productively used on other socioeconomic activities.
4. **Provides Strong Economic Return** - According to the WHO, for every \$1 invested in water and sanitation, there is an economic return of between \$3 to \$34.³⁴

Educational Impact

Providing a device that generates water within 15 minute walk has significant implications to school children. According to the UN, **443 million school days are lost every year because of water and sanitation related diseases**.³⁵ Parasitic infections transmitted through unsafe water also hamper children's learning potential and it remains very difficult to recruit good teachers for work in schools in which no clean water is available. Assuming only a hyper-conservative 1% of the 443 million school days are averted due to local fresh water supply, the Water Generators would enable up to an additional 4.4 million school days per year with significant positive sociological and economic impact.

Summary

SunToWater's Water Generators are expected to save between 1.5 million and 3.2 million people per year, with this number increasing to over 5 million people annually as water scarcity worsens. Over the coming decade as the water scarcity escalates, Water Generators could save as many as 50 million lives. The Water Generators are also expected *improve* up to 10x that many lives per year in Africa alone.

³² http://www.unicef.org/media/media_45481.html

³³ Sources: Hutton 2013 *Global costs and benefits of drinking-water supply* World Health Organisation Koolwal and van de Walle (2010) World Bank

³⁴ <http://water.org/water-crisis/water-facts/economics/>

³⁵ <http://www.wvi.org/water-sanitation-hygiene/water-facts>
(United Nations News Service, 2010)

Commitment to Success

SunToWater is committed to bringing this innovative and life-saving technology to market.



40-100 gallon per day unit



1600-4000 gallon per day unit

More Information

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CLEAN WATER SAVES LIVES

	Total units required (assumes 1/location)	Total Addressable Lives	Lives Saved with Ultra-Pure Water	Lives Saved with Potable Water	Lives Saved with Sanitation or Agricultural Water	TOTAL LIVES SAVED over 10-years (unit warranty)	Cost of units	Cost to Save a Life
Units Delivered to Medical Clinics		1000 patients/clinic	1%	1%	1%	10	\$5,000	
Units for 10,000 clinics	10,000	10,000,000	100,000	100,000	100,000	3,000,000	\$ 50,000,000	\$17
Units for 25,000 clinics	25,000	25,000,000	250,000	250,000	250,000	7,500,000	\$ 125,000,000	\$17
Units for 50,000 clinics	50,000	50,000,000	500,000	500,000	500,000	15,000,000	\$ 250,000,000	\$17
Units for 100,000 clinics	100,000	100,000,000	1,000,000	1,000,000	1,000,000	30,000,000	\$ 500,000,000	\$17
Units for 186,000 clinics	186,000	186,000,000	1,860,000	1,860,000	1,860,000	55,800,000	\$ 930,000,000	\$17
Units Delivered to Combat Dehydration		1 unit / 40 people		50%	50%	10	\$5,000	
Units for 5,000 locations	5,000	200,000	-	100,000	100,000	2,000,000	\$ 25,000,000	\$13
Units for 25,000 locations	25,000	1,000,000	-	500,000	500,000	10,000,000	\$ 125,000,000	\$13
Units for 50,000 locations	50,000	2,000,000	-	1,000,000	1,000,000	20,000,000	\$ 250,000,000	\$13
Units for 100,000 locations	100,000	4,000,000	-	2,000,000	2,000,000	40,000,000	\$ 500,000,000	\$13
Units for 200,000 locations	200,000	8,000,000	-	4,000,000	4,000,000	80,000,000	\$ 1,000,000,000	\$13
Lives Improved		1 unit / 40 people		50%	50%	10	\$5,000	
Economic Impact	50,000	2,000,000	-	1,000,000	1,000,000	20,000,000	\$ 250,000,000	\$13
Education Impact	50,000	2,000,000	-	1,000,000	1,000,000	20,000,000	\$ 250,000,000	\$13
Food Production	50,000	2,000,000	-	1,000,000	1,000,000	20,000,000	\$ 250,000,000	\$13

Alternative Calculation								
Assume each unit only saves 1 life per day - very likely since it produces 40 gallons/day, enough for 40 people per day, of which we can assume 1 would be life saving (ultra-pure, potable or sanitation).								
That means each unit saves <u>at least</u> 365 lives per year.								
Over the 10-year life of the unit, each unit will save at least 3,650 lives per year.								
10,000 units would therefore save 36.5 million lives over 10 years.								
Each unit costs approximately \$5000 (less with volume manufacturing, plus logistic costs, so \$5k is a fair estimate)								
Total cost for 1,000 units is \$5 million (1,000 x \$5,000) and will save 3.65 million lives (3,650 x 1,000) over 10 years.								
Total cost for 10,000 units is \$50 million (10,000 x \$5,000) and will save 36.5 million lives (3,650 x 10,000) over 10 years.								
The cost to save each life is \$13.69 (\$50 million / 36.5 lives).								