USTechH2.O

A US World Water Day Event

Co-Hosts:

U.S. WATER PARTNERSHIP
for a water secure world

March 21, 2014
Washington, DC
U.S. State Department

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I. Executive Summary

Rationale

The U.S. Water Partnership (The Partnership) recognizes the transformative role water technologies can play in both addressing global water nexus challenges and creating economic opportunities in the U.S. and abroad. Breakthroughs, especially for technologies pertaining to the security of vital resources, will be necessary to meet the food, water and energy needs of the world's population. Nearly half of the world's population will live in areas experiencing severe water stress.

According to the National Intelligence Council 2030 Global Trends, demand for food is expected to rise at least 35 percent by 2030 while demand for water is expected to rise by 40 percent.[1] Fragile states in Africa and the Middle East are most at risk of experiencing food and water shortages – however China and India are also vulnerable. Increasing water scarcity coupled with climate change presents global water challenges. The U.S. Department of Defense 2014 Quadrennial Defense Review echoes the key findings from the 2012 National Intelligence Community Assessment, which identifies climate change and water scarcity as threat multipliers in countries important to the U.S.

With increasing scarcity, technologies offer solutions to assist in increasing water efficiency and reducing costs for utilities. For example, approximately 45 percent of water in Latin America is lost before it reaches the consumer.[2] In Brazil alone, if the top utilities reduced current levels of this unaccounted for water, the potential savings is approximately US$4 billion per year.[3] This savings can be used to expand coverage to the most vulnerable populations, improve service quality and facilitate continued growth in the region. There is a potential for exemplar technologies to build water security, deliver economic savings and benefits to water-nexus issues.

Event Description

In response to the need for technologies to address global water challenges, the U.S. Water Partnership and the U.S. State Department showcased exemplar water technologies at "USTech H2.O," a half-day event held on Friday, March 21, 2014 in Washington, DC. Twenty-five water technologies were on display as part of an interactive exhibit and presentations. More than 200 people, comprised of the U.S. water sector and diplomatic stakeholder leaders, were in attendance.

The exemplar technologies are representative of potential innovations for and should serve as a guidepost for U.S. leadership in the water technology space. Nevertheless they do not provide all the possible solutions or kinds of technologies available by the U.S. water sector. The event allowed

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[1] National Intelligence Council. 2012. "Global Trends 2030: Alternative Worlds". Available Online: http://www.dni.gov/files/documents/GlobalTrends_2030.pdf.

[2] World Bank. 2013. "Latin America: Why are water companies trying to save energy" Available Online: http://www.worldbank.org/en/news/feature/2013/09/03/latin-america-water-loss-energy-efficiency

[3] International Finance Corporation. 2012. "Squeezing out the Drops – Improving Water Utility Efficiency Through Performance-Based Investment". Public-Private Partnerships Conference. Dakar, Senegal. Available Online: http://www.icafrica.org/fileadmin/documents/ICA_sponsored_events/IFC_PPP_Water_Dakar_June2012/Presentations/Training_Day/T%202b_PBC_Mullen.pdf.

technology providers, U.S. export assistance and development agencies and senior leaders from the private sector and civil society to explore opportunities for collaboration and concentrate American ingenuity where water challenges are the greatest.

Key Findings

Several key findings emerged, which include:

- Finding #1: Solutions exist to complex global water challenges, but they require a collaborative approach across government, private sector and civil society organizations to apply the best science, technical and business expertise. Understanding local water needs and diagnosing the appropriate technology in a sustainable way will require different sets of expertise and resources.
- Finding #2: Exemplar U.S. water technologies can be applied across a range of water issues in both developed and emerging markets. These challenges include:
    - Water-energy nexus issues focused on improving efficiencies and water productivity;
    - Water-food nexus issues promoting conservation and recycling;
    - Improved integrated water resources management;
    - Improving access to WASH; and
    - Monitoring water supply to address non-revenue water issues.
- Finding #3: Innovation encompasses both the application of new technologies and new applications of existing technologies.
- Finding #4: Partnership approaches allow advanced technologies to be applied in simple ways to produce impactful results for economies and communities.
- Finding #5: Supply-side and demand driven pressures on scarce water resources require integrated, holistic approaches, which consider water-energy-food nexus issues.
- Finding #6: The Partnership is well positioned to aid in technology deployment and market entry with the technical expertise resident in its diverse membership and access to key decision makers across the public and private sectors.
- Finding #7: Scale and design matters. Developing the right mix of partners and resources to get a technology on the ground depends on the local water challenges and needs. Appropriate technologies for household water treatment require different financial and technical assistance compared to larger infrastructure technologies, which also impacts which U.S. government agencies to partner.

Next Steps

The event was the beginning of conversations that could further explore and identify areas for alignment. The findings will inform approaches of other Partnership priorities such as utility strengthening, sustainable agriculture, WASH, water security and early warning systems that could help communities build resilience. Incorporating these lessons into the Partnership's goals and key activities will focus on the following next steps:

1) Support members' current activities and programs in innovative water technologies;

2) Develop a matrix of innovative technologies versus the specific water issues, geographies and scales; and
3) Identify alignment with programs of U.S. Small Business Administration, U.S. Department of Commerce and other U.S. government agencies to facilitate leveraging The Partnership's resources to support these programs.

II. Background

Global water challenges create opportunities to harness innovative partnerships among companies, U.S. government agencies and civil society to deploy water technologies that address local water challenges and can be scaled for both developing and developed world applications. Investing in such water solutions is a win-win scenario in which the promotion of commercial opportunities abroad builds global water security and generates domestic economic development potential.

Water plays an important role in the global economy and has an estimated market value of $500 billion per year.[4] The U.S. is a leader in environmental technology innovation. According to the U.S. Department of Commerce, in 2011 the U.S. environmental sector generated about $319 billion in revenues, employed nearly 1.7 million Americans and included approximately 117,000 companies.[5]

The Partnership worked with its members to identify exemplar U.S. technologies that address multiple water challenges. The world is entering into a more demanding environment with increasing frequency and magnitude of extreme weather events, such as floods, droughts and tropical storms. Technology can help build more resilient infrastructure and assist decision makers in preparing for and managing water-energy-food nexus issues.

By collaborating with the U.S. State Department and leveraging the expertise and resources of members, the Partnership sent out a call for information and developed a transparent independent review panel to assess the technology applications. This process was to identify and feature exemplar U.S. water technologies during a showcase event, USTech H2.O, on March 21, 2014 celebrating World Water Day. A complete list of the featured technologies is available in Appendix A.

International Development Enterprises (iDE) and **Toro** booth exhibit at U.S. State Department, March 21, 2014.

[4] TechKNOWLEDGEy Strategic Group. 2013. *2013 Water Market Review: Growing Awareness, Growing Risks*. Issue 16. Available Online: http://www.tech-strategy.com/pdf/Winter2013.pdf.
[5] Ibid.

The objectives for the exemplar U.S. water technology showcase included:

- Create a transparent selection process of exemplar U.S. water technologies;
- Raise awareness of U.S. innovation to address global water challenges;
- Increase opportunities for collaboration between U.S. government agencies and water technology providers; and
- Identify potential alignment between the featured exemplar water technologies and U.S. Water Partnership Signature Initiatives.

The U.S. State Department and the U.S. Water Partnership Secretariat were the lead conveners on the innovative U.S. water technology event, but many organizations contributed resources and expertise throughout the process. These organizations included:

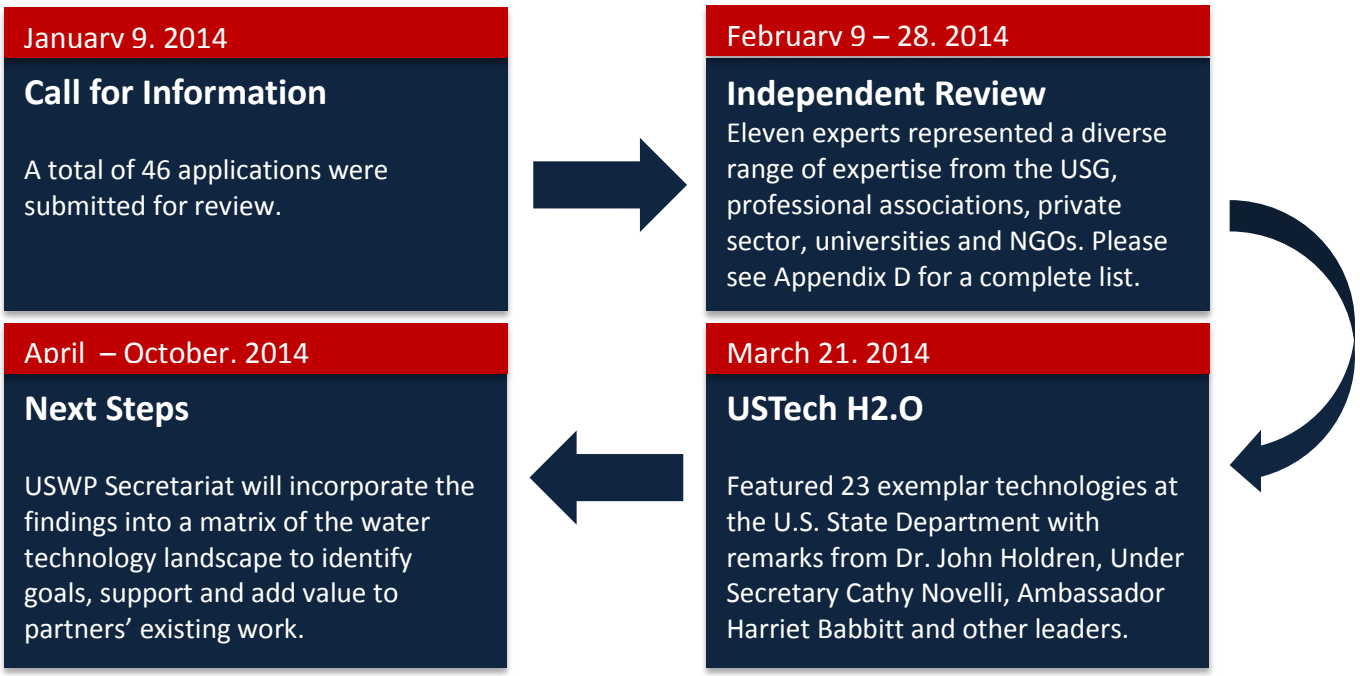
- American Society of Civil Engineers (ASCE);
- Cascade Design;
- Colorado State University;
- Imagine H20;
- International Association of Plumbing and Mechanical Officials (IAPMO);
- International Development Enterprises (iDE);
- McWane, Inc.;
- NSF International;
- U.S. Agency for International Development
- U.S. Department of Energy, Sandia National Laboratories;
- U.S. Environmental Protection Agency;
- Patel College of Global Sustainability, University of South Florida;
- Small Business Administration;
- Toro Micro-Irrigation;
- Water Environment Research Foundation; and
- Xylem, Inc.

The USTech H2.O event was sponsored by the generous support of McWane, Inc. – a leading water infrastructure company that is pioneering new technologies to improve water efficiency and address non-revenue water.

III. Technology Assessment Methodology

The following section outlines the assessment process which evaluated the exemplar U.S. water technologies featured at the USTech H2.O event. Figure 1 summarizes the process, which is described in more detail in Appendices B, C and D.

Figure 1: Process Overview



IV. Showcase of Exemplar U.S. Water Technologies at the USTech H2.O Event

The U.S. Water Partnership and the U.S. State Department showcased the selected exemplar water technologies in Washington, DC at "USTech H2.O," for the purpose of raising awareness of American ingenuity to address global water challenges in addition to creating networking opportunities and consultations between the tech providers and U.S. government agencies. More than 200 people, comprised of the U.S. water sector and diplomatic stakeholders, attended the tech event.

Dr. John Holdren, *Director, White House Office of Science and Technology Policy* providing remarks at the U.S. State Department, March 21, 2014.

Presentations

The event featured remarks by several leaders from the private and public sector, including the President's *Science Advisor and Director of the White House Office of Science and Technology Policy* **Dr. John Holdren** who underscored the intersection between water, energy, climate change and

innovation. Dr. Holdren said, "The companies here today are bringing forward groundbreaking techniques for getting the most out of the water we've got and I couldn't be more enthusiastic about endorsing that idea." Dr. Holdren's full remarks are available here.

In response to Dr. Holdren's comments, **Mr. Ruffner Page, Jr.**, *President, McWane, Inc*. described how McWane is improving water efficiency by using the innovative SNAP wireless mesh operating system in order to better manage and understand how water moves in urban landscapes. Mr. Page said, "We are pleased to link water infrastructure and the need for long lasting reliable products with one small example…of how new technologies can take many, many steps to improve the efficiency of water systems."

Other speakers included **Dr. Kerri-Ann Jones**, *Assistant Secretary of State for Oceans, International Environmental and Scientific Affairs*; **Ms. Catherine Novelli**, *Under Secretary of State for Economic Growth, Energy, and the Environment*; **Mr. John Spears**, *Director of Innovation and Clusters, U.S. Small Business Administration*; **Ambassador Harriet Babbitt**, *Chair, U.S. Water Partnership Steering Committee* and **Mr. Chris Holmes**, *Global Water Coordinator*, *U.S. Agency for International Development (USAID)*.

Charles Fishman, *Author, The Big Thirst*, at U.S. State Department, March 21, 2014.

Mr. Charles Fishman, author of "The Big Thirst" was the emcee of the event. He underscored that "innovation [is] going on everywhere...the revolution is coming to water, and you're getting a taste of it today." But this takes collaboration and according to Mr. Spears highlighted the importance of, "[putting] together the very best team from a variety of different disciplines." The event brought together the components of the right team according to Under Secretary Novelli who said, "we have the brain trust for solutions – scientists, entrepreneurs, businesses, NGOs, even a few diplomats, all with the same goal: to excite the world about American-developed innovative technologies for solving some of the world's most pressing water challenges."

Mr. Holmes announced USAID's semi-finalists for the *Securing Water for Food Grand Challenge* and launched the Brackish Water Desalinization Prize. These competitions highlight innovative technologies applied to water-food-energy nexus issues. The full-length video presentation is available here.

Technology Exhibits

In addition to the presentations, there was an interactive exhibit hall. Brief descriptions of the technologies are available in Appendix A. The technologies address key water challenges in the categories below:

Water-Food Nexus – Approximately 70 percent of freshwater is used for irrigation. Improving efficiency and productivity of water and nutrient use is increasingly important for economies and ecosystems.

Water-Energy Nexus – It takes a lot of energy to move and treat water and a lot of water to produce energy. Demand for both is estimated to increase. Global water demand is projected to increase by 55 percent by 2050 and global energy demand is expected to grow by more than one-third by 2035.[6] The International Energy Agency estimated that global water withdrawals for energy production were 583 billion m^3 but only 66 billion m^3 was consumed.[7]

Improving Access to Water, Sanitation and Hygiene (WASH) – Progress has been made on improving WASH access, but more work is needed to deliver safe drinking water to over 768 million people living without access. A range of exemplar water technologies assist with delivering safe drinking water through low-energy, low-cost and decentralized approaches.

Improving Integrated Water Resources Management (IWRM) – 2008 marked the first time that half of the world's population lived in urban areas, with two-thirds of this in low-income and middle-income nations. This is estimated to rise to 60 percent in 2030, and the majority of urban residents will live in towns and cities with populations of less than one million where urban infrastructure and institutions are least able to cope with flooding and storm water runoff.[8]

Monitoring – Approximately 45 percent of water in Latin America is lost before it reaches the consumer.[9] In Brazil, if the top utilities reduced current levels of non-revenue water – the potential savings is approximately US$4 billion per year.[10] This unaccounted for water is known as non-revenue water and poses a challenge for water utilities around the world. Improved monitoring to address non-revenue water issues presents important opportunities for innovation.

A few of examples of the exhibits are featured in short videos:

- Cascade Designs is available here;
- Floating Islands is available here;
- Puralytics is available here; and
- Xylem, Inc. is available here.

U.S. Government agencies involved in technology development, commercialization and export support, including the Small Business Administration, the U.S. Environmental Protection Agency, the U.S. Trade and Development Agency, the Overseas Private Investment Corporation, the Export-Import Bank, the

[6] UN-Water. 2014. "World Water Development Report 2014." Executive Summary. Available Online: http://unesdoc.unesco.org/images/0022/002257/225741E.pdf.
[7] Ibid.
[8] Abhas, J. et al. 2012. *Cities and Flooding: A Guide to Integrated Flood Risk Management for the 21st Century* and *A Summary for Policy Makers*. World Bank. Available Online: http://www.gfdrr.org/sites/gfdrr.org/files/publication/World_Bank_Cities_and_Flooding_Guidebook.pdf.
[9] World Bank. 2013. "Latin America: Why are water companies trying to save energy" Available Online: http://www.worldbank.org/en/news/feature/2013/09/03/latin-america-water-loss-energy-efficiency.
[10] International Finance Corporation. 2012. "Squeezing Out the Drops – Improving Water Utility Efficiency Through Performance-Based Investment." Public-Private Partnerships Conference. Dakar, Senegal. Available Online: http://www.icafrica.org/fileadmin/documents/ICA_sponsored_events/IFC_PPP_Water_Dakar_June2012/Presentations/Training_Day/T%202b_PBC_Mullen.pdf.

Millennium Challenge Corporation, USAID and the U.S. Department of State engaged with the technology companies present through meetings and networking.

Ambassador Babbitt summarized the day's events, "One of the things I think that is the most satisfying about working on many of these water issues [is that] they are fixable… The U.S. Water Partnership is committed to fostering a collaborative and holistic approach to make a real difference in the lives of people around the globe."

Technology Provider Feedback

The event allowed for numerous networking opportunities for technology providers and a captive Washington, DC audience. The tech providers shared feedback on a range of topics, including the following key issues:

- #1: Tech providers welcome more opportunities to engage federal agencies and decision makers regarding key export assistance services and new market access.
- #2: Tech providers benefited from the designation as exemplar technology, which helped with marketing efforts among their agents, distributors and potential customers.
- #3: Appropriately designing products for emerging and developing markets is important in ensuring positioning to key possible buyers.

Ambassador Harriet Babbitt, *Chair, U.S. Water Partnership* providing remarks at the U.S. State Department, March 21, 2014.

- #4: The event initiated early conversations to build future potential business opportunities.
- #5: There are opportunities to build urban resilience for municipal water systems with innovative technologies.

Social Media and Press Report

The exemplar technologies were broadcast to a wide domestic and global audience. With the support from the U.S. State Department's Bureau of Oceans and International Environmental and Scientific Affairs (OES) and the Bureau of International Information Program (IIP) social media team, created a social media package about the US Tech H2.O event, and jointly distributed to Posts worldwide through email and the IIP Daily Social Media Feed. Over 50 embassies, consulates, bureaus, and USG officials amplified the event by using our #USTechH2O content and hashtag. The full list is included below.

OES also published a World Water Day entry on the Department of State's official blog. It received 750 likes, 227 shares, and 52 comments on the Department's official Facebook page and nearly 260 retweets

and 153 favorites on the Department's official Twitter, in addition to being shared on the OES and other embassy/consulate social media platforms.

IIP's Our Planet social media team supported the event via social media with:

- Several live tweets from the event, which reached 61,714 accounts on Twitter and were seen by 66,822 people
    1. A **blog post** on World Water Day & State's Water Technologies Event, which received 508 link clicks from around the world, including Pakistan, Afghanistan, Tanzania, Thailand, the Netherlands, Iceland, Indonesia, India, and Turkey
    2. A **Facebook post**, which linked to the blog, and reached 10,844 people. This Facebook post received 235 likes, 11 comments, 11 shares, and 318 clicks to the blog post
- Four videos from water tech participants, posted on **YouTube**, received 313 views total

U.S. Embassies/Consulates, Bureaus & Officials who used #USTechH2O Content:

- Ambassador McCarthy (Lithuania)
- Association of Southeast Asian Nations
- Brussels
- Burma
- Cambodia
- Canada
- Czech Republic
- Fiji
- Germany
- Guatemala
- Holy See/Vatican
- Iceland
- India
- Israel
- Italy
- Kazakhstan
- Kenya
- Latvia
- Mozambique
- Nepal
- New Zealand
- Nigeria
- Portugal
- Senator Mark Udall (D-Colorado)
- Singapore
- Slovenia
- STAS Advisor
- Tanzania
- Thailand
- Turkey
- U.S. Consulate in Chennai
- U.S. Consulate in Hyderabad
- U.S. Consulate in Karachi
- U.S. Consulate in Kolkata
- U.S. Consulate in Lahore
- U.S. Consulate in Leipzig
- U.S. Consulate in Milan
- U.S. Consulate in Surabaya
- U.S. Mission to the UN in Vienna
- U.S. State Department Africa Regional Services
- U.S. State Department Bureau of African Affairs
- U.S. State Department Bureau of Oceans and International Environmental and Scientific Affairs
- U.S. State Department Economic Bureau
- U.S. State Department Global Partnerships Initiative
- U.S. State Department IIP - Democracy Challenge

- U.S. State Department IIP - Our Planet
- U.S. State Department International Organizations Bureau
- U.S. State Department Office of the Science and Technology Adviser to the Secretary
- Uganda
- UK Press Office
- USAID Development Innovation Ventures
- Zimbabwe

Press Coverage:
The event was featured by several news reporting organizations, blogs and companies which included:

- Aquagenx;
- Evidence in Action;
- EIN News;
- Justmeans.com blog;
- The Pueblo Chieftain;
- Reuters;
- U.S. State Department's blog;
- The Wall Street Journal;
- WaterCitizen News;
- White House website;
- Xinhua News; and
- Yahoo! Finance.

V. Key Findings and Next Steps

The U.S. Water Partnership leveraged the expertise and resources of its partners to identify and feature exemplar U.S. water technologies. The Partnership applied a transparent selection process and collected high-level decision makers to present at the event. This raised the profile of innovative U.S. water technologies and increased networking opportunities. The event was the beginning of conversations that could further explore and identify areas for alignment. It is important to emphasize that the KPIs applied to both developed and developing markets. At the initial stage the Partnership preferred a wide application of water technologies.

As the Partnership explored the potential application of these technologies, several key findings emerged which include:

- Finding #1: Solutions exist to complex global water challenges but they require a collaborative approach across government, private sector and civil society organizations to apply the best science, technical and business expertise. Understanding local water needs and diagnosing the appropriate technology in a sustainable way will require different sets of expertise and resources.
    - Evidence: U.S. Agency for International Development (USAID) launched the Global Development Lab, where it is partnering with 32 universities, corporations and foundations to use science and technology to help find methods of alleviating poverty.

    - These partners – including U.S. Water Partnership members such as The Coca-Cola Company and World Vision – will support breakthrough solutions in water, health, food security, energy, education and climate change.
    - The Aquagenx Compartment Bag Test (CBT), one of the selected U.S. exemplar technologies developed by scientists from the University of North Carolina at Chapel Hill Gillings School of Global Public Health, was identified by the Global Development Lab as a technology that enables portable, simple, quantal water quality testing and monitoring of *E. coli* bacteria to determine if water in any location and from any water source poses a health risk, before and after treatment and during storage and use.
- Finding #2: Exemplar U.S. water technologies can be applied across a range of water issues in both developed and emerging markets. These challenges include:
    - Water-energy nexus issues focused on improving efficiencies and water productivity;
        - Evidence: Please see Appendix A
    - Water-food nexus issues promoting conservation;
        - Evidence: Please see Appendix A
    - Improved integrated water resources management;
        - Evidence: Please see Appendix A
    - Improving access to WASH; and
        - Evidence: Please see Appendix A
    - Monitoring water supply to address non-revenue water issues.
        - Evidence: Please see Appendix A
- Finding #3: Innovation encompasses both the application of new technologies and new applications of existing technologies.
    - Evidence: Xylem's Essence of Life (EOL) uses as a sustainable business model that applies a simple treadle-pump technology (Saajhi Stepping pump) to reach smallholder farmers at the base of the economic pyramid.
    - EOL does this using an innovative public-private collaboration strategy with its roots in academic thought leadership – to break through the physical, economic and other entrenched factors that limit agricultural productivity.
    - EOL connects farmers with the products they need to grow, while providing a sustainable service proposition and building new markets.
    - The Saajhi Stepping pump uses 40 percent less water and results in a 25 percent reduction in labor time compared with traditional furrow irrigation methods.
- Finding #4: Partnership approaches allow advanced technologies to be applied in simple ways to produce impactful results for economies and communities.
    - Evidence; The Flint River Basin Partnership is designed to help farmers in the Lower Flint River Basin of Georgia (USA) conserve water using new and innovative irrigation technology.
    - With corporate support from The Coca-Cola Company and program support from U.S. Department of Agriculture's (USDA) Natural Resource Conservation Service, the partnership applies IBM's "Deep Thunder" technology which integrates soil moisture

data with a hyper-local weather forecasting system and USDA's Irrigator Pro technology to give farmers in the field, site–specific irrigation scheduling recommendations based upon advanced crop models and drought–adaptive strategies. This allows a farmer in the field to better manage and more accurately predict when and where it will rain.
    - Improving water conservation and irrigation practices to increase farmer production delivers real economic benefit to the Lower Flint River Basin, which is the epicenter of agriculture in Georgia (USA) with 27 counties contributing more than $2 billion in annual farm-based revenue to the region.
- Finding #5: Supply-side and demand driven pressures on scarce water resources require integrated, holistic approaches, which consider water-energy-food nexus issues.
    - Evidence: iDE and Toro used a public-private partnership to implement a hybrid value chain approach that will improve food and water security by applying drip irrigation for smallholder farmers.
    - Integrating iDE's market knowledge with the Toro Drip Kit into iDE's existing supply chain established a reliable commercial distribution network.
    - Creating the linkages throughout the entire supply chain ensured smallholder farmers have access to this technology have access to the same technology and benefits that until now have only been available to large multinational farming operations.
    - Making this technology available to smallholder farmers could not have been accomplished without the knowledge of Toro's irrigation engineers and iDE's in-country staff of agriculture experts.
- Finding #6: The Partnership is well positioned to aid in technology deployment and market entry with the technical expertise resident in its diverse membership and access to key decision makers across the public and private sectors.
    - Evidence: The Partnership leveraged expertise of eleven experts from U.S. government agencies, professional associations, private sector, universities and NGOs to select exemplar technologies during the initial assessment phase.
    - During the USTech H2.O event, this selected pool of exemplar technologies was able to connect with a mixture of development and export oriented U.S. federal agencies to identify potential opportunities in emerging markets.
    - The Partnership offers an established collaborative structure to support ongoing efforts of U.S. technology organizations to expand in emerging markets.
- Finding #7: Scale and design matters. Developing the right mix of partners and resources to get a technology on the ground depends on the local water challenges and needs. Appropriate technologies for household water treatment require different financial and technical assistance compared to larger infrastructure technologies, which also impacts which U.S. government agencies to partner.
    - Evidence: Overseas Private Investment Corporation (OPIC) limits the risk for the private sector to engage in development focused projects for both large infrastructure and community level development projects. Because OPIC works with the U.S. private

sector, it helps U.S. businesses gain footholds in emerging markets, catalyzing revenues, jobs and growth opportunities both at home and abroad.

- U.S. Trade and Development Agency (USTDA) offers a different set of skills and helps companies create U.S. jobs through the export of U.S. goods and services for priority development projects in emerging economies.
- USTDA links U.S. businesses to export opportunities by funding project planning activities, pilot projects, and reverse trade missions while creating sustainable infrastructure and economic growth in partner countries.
- USTDA is supporting a feasibility study in Brazil that aims to help Manaus Ambiental, a Brazilian water utility, become a profitable water utility by reducing non-revenue water (NRW) and becoming more energy efficient.

The findings will inform approaches of other Partnership priorities such as utility strengthening, sustainable agriculture, WASH, water security and early warning systems that could help communities build resilience. For example, access to a treadle pump and access to ground water delivers consistent income and nutritious food throughout the year. Coupled with the right institutional and governance framework, technologies can have a transformative effect on communities by improving water efficiencies, building food security, and delivering health and economic benefits to households.

Incorporating these findings into the Partnership's goals and key activities will focus on the following next steps:

Next Step #1: The Partnership Secretariat will share this report and connect the findings to support Partnership members' current activities and programs focused on innovative water technologies. A few examples include:

- USAID is expanding their presence and focus on applied science and technology with the Global Development Lab, in addition to the Securing Water for Food Challenge and the Brackish Water Desalination Prize;
- U.S. EPA released the 2014 Water Technology Innovation Blueprint Version 2 that outlines the market opportunities and identifies actions to collaborate with utilities, U.S. government agencies, industry, entrepreneurs and investors to support technology innovation;
- Imagine H20 works with top water entrepreneurs for their annual water innovation competition; and
- The Milwaukee Water Council serves as a regional cluster and runs a Global Freshwater Seed Accelerator Program.

In addition there is a range of technology developers and providers within the Partnership's membership which include:

- Technology Developers – McWane, Inc., Jacobs Engineering, Valmont Industries and Xylem, Inc.;
- Technology Implementers – CH2M Hill, iDE, Millennium Challenge Corporation, USAID and World Vision.

Next Step #2: The Secretariat will develop a matrix that outlines the landscape of innovative U.S. water technologies to identify areas of alignment and gaps. This will facilitate linking the appropriate technologies with the specific water issue, geography or scale. A supporting White Paper would be shared with USWP partners for comment and input. The U.S. Water Partnership Web Portal is another resource that could support being a centralized hub of water technology information.

Next Step #3: The Secretariat will explore opportunities with the Small Business Administration and the U.S. Commerce Department to identify alignment and how the Partnership can leverage its network to support existing programs. One potential avenue for future collaboration could be developing an export marketplace for U.S. water technologies. This marketplace would identify where water needs and opportunities are around the world and match the U.S. water technologies which meet those needs.

As the Secretariat addresses the above next steps, it will gain a better understanding for how an "entire of U.S." approach would incorporate innovative technologies. This will be an ongoing and iterative process that will add value to other Partnership priorities and signature initiatives.

Appendix A: List of Exemplar U.S. Water Technologies

Technology Provider	Contact Information	Brief Description	Images	Category
Flint River Basin Partnership	David Reckford d@teamflint.us (229) 400-0035 	Smart data collection technology so a farmer in the field can direct center pivot irrigation based on when and where it will rain. Currently, the partnership team is working to: 1) integrate remote soil moisture data with variable rate irrigation to apply water only where and when needed; 2) verify the capacity of IBM's Deep Thunder® weather forecasting tool to optimize agricultural production systems; and 3) develop a low-cost, low-energy, cell phone based irrigation control system powered by USDA-ARS's Irrigator Pro to provide site-specific irrigation scheduling recommendations based on advanced crop models and drought-adaptive strategies.		Water-Food Nexus

Technology Provider	Contact Information	Brief Description	Images	Category
iDE and Toro	Kevin Andrezejewski (802) 345-1422 kandrezejewski@ideorg.org  Eduardo Mendias (619) 208-4333 Eduardo.Mendias@toro.com 	The Small Farm Kit has been designed to address the irrigation needs of subsistence farmers throughout the developing world. Through a collaborative Human Center Design process, iDE has leveraged Toro's world-class Drip Irrigation Technologies to design an effective system for growing conditions found throughout Africa, Asia and Latin America.	 	Water-Food Nexus

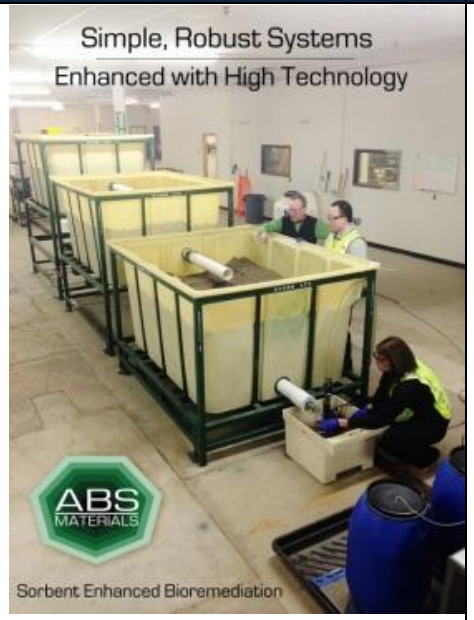
Technology Provider	Contact Information	Brief Description	Images	Category
Xylem, Inc.	Keith Teichmann Keith.teichmann@xyleminc.com (617) 283-5495  Sam Rulli Samuel.rulli@xyleminc.com (978) 282-5264 	Xylem's Essence of Life is a sustainable business model which utilizes a hybrid value vain approach to break through physical, economic and other entrenched factors to deliver definitive shared value to and support enterprise development in rural communities. The Saajhi™ stepping pump, an innovative application of Xylem's water technology in an ergonomically tuned, small-holder farmer defined water application pump.	 	Water-Food Nexus

Technology Provider	Contact Information	Brief Description	Images	Category
KII, Suns River	Hill Kemp hillk@suns-river.com (318) 315-1534  	The Suns River solar desalination process is a technology that operates off of 99 percent solar energy. This technology is cost competitive with Reverse Osmosis (RO) and is scalable from one family to a town or city. Suns River uses highly innovative principles and processes to harness the power of the sun to distill a variety of inputs including but not limited to: seawater, river water, saline well water and waste water. It is simple to install and operate and does not require huge amounts of energy to produce 'fresh water'. The Suns River Solar Still has near zero carbon foot print. The patented Suns River technology can operate producing only distilled water and dry salt (Zero Liquid Discharge - ZLD) either off-grid or with 99+ percent solar energy.		Water-Energy Nexus

Technology Provider	Contact Information	Brief Description	Images	Category
Nalco	Joseph Carl Bopp jcbopp@nalco.com (630) 305-1012  Ramola Musante rmusante@nalco.com (202) 534-4952 	Nalco's 3D TRASAR™ Cooling Water Technology continuously monitors building cooling water systems to detect water quality issues in real-time and dispense precise chemistry to optimize system performance, reduce water and energy use, and protect assets. The addition of solid chemistry technology and innovative dispensing equipment increases on-site safety and provides additional sustainability benefits.	 	Water-Energy Nexus

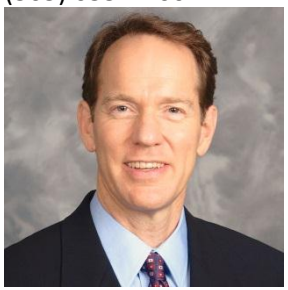
Technology Provider	Contact Information	Brief Description	Images	Category
Natel Energy	Gia Schneider gia@natelenergy.com (917) 558-2718  Adam Atkinson-Lewis, adamal@natelenergy.com (781) 738-4071 	Natel's hydroEngine™ generates EcoSmartHydro™ power at low heads and high flows, delivering clean, reliable baseload power. The scalable nature of the technology means that hydroEngines™ can be used to electrify rural areas as part of a micro-grid as well as to power grid-connected, distributed, utility-scale projects.	 	Water-Energy Nexus

Technology Provider	Contact Information	Brief Description	Images	Category
Tusaar Corp	Gautam Khanna gck@tusaar.com (970) 291-1079 	Tusaar offers a simple, environmentally friendly and economical means of removing multiple metals from water. The water treatment media is manufactured by doping select commercially available organic ligands on a granulated activated carbon (GAC) substrate. The media operates over a wide ph range, in the presence of significant organic and inorganic contaminants. The sequestered metals can be removed from the media using commonly available chemicals and the media regenerated for reuse. The process is not capital intensive and operates without electricity is necessary, uses no toxic chemicals and user training is simple. The R&D of this technology was partly funded by the U.S. Department of Energy for the development of a multi-metal water treatment system for water influenced by the burning of coal at coal fired thermal power plants.		Water-Energy Nexus

Technology Provider	Contact Information	Brief Description	Images	Category
ABS Materials	Stephen Spoonamore s.spoonamore@absmaterials.com (202) 351-1883 	ABS Materials manufactures Osorb reactive glass materials which can capture and destroy a wide range of volatile organic pollutants, even at very low levels. These pollutants include: oil and gas spillage and waste, mining and other leachates, pharmaceuticals, trace PAHs, herbicides and pesticides.		WASH

Technology Provider	Contact Information	Brief Description	Images	Category
AguaClara	Sarah Long slong@aguaclara.cc, (804) 548-9025  Monroe Weber-Shirk monroe.weber-shirk@cornell.edu, (607) 216-8445 	Applies 3-D modeling for local sourced treatment plants that use unique energy efficient gravity powered treatment process. AguaClara technologies are uniquely capable of producing drinking water meeting U.S. EPA standard from turbid surface waters (up to 1000 NTU) without using any electricity. The treatment process — flow measurement, chemical metering, rapid mix, flocculation, sedimentation and filtration — is powered by gravity, with a total elevation drop of less than 1.5 m, using far less energy than mechanized water treatment plants.	 	WASH

Technology Provider	Contact Information	Brief Description	Images	Category
Applied Environment Technologies	Dr. Daniel Smith, P.E, DEE, DPSmith_AET@verizon.net (813) 716-2262 	AET's Multi-Chamber Treatment and Recovery Process (MCTRP) treats and recovers resources from human sanitation water at small, local scale. MCTRP recovers a high percent of nitrogen from sanitation water nitrogen and make it available for beneficial reuse, including food production. MCTRP provides a sustainable sanitation approach with a low life cycle cost that features completely passive operation, resilient performance and zero energy requirement.		WASH

Technology Provider	Contact Information	Brief Description	Images	Category
Aqua Sciences, Inc.	Scott Morris scott@aquasciences.com (305) 655-1460  David Murphy, david@aquasciences.com (305) 655-1460 	Aqua Sciences, Inc. delivers an innovative and proprietary technology that cost-effectively extracts moisture from the air to create clean drinking water. Unlike conventional approaches to removing water from the air, Aqua Sciences' suite of atmospheric water generation products can generate large volumes of drinking water in nearly any climate condition, including arid regions across the globe.		WASH

Technology Provider	Contact Information	Brief Description	Images	Category
Aquagenx	Dr. Mark Sobsey mark_sobsey@unc.edu (919) 906-2740  Lisa Hirsh lhirsh@aquagenx.com (919) 590-0343 	The Aquagenx Compartment Bag Test (CBT) is a simple, portable water quality test that detects and quantifies *E. coli* bacteria in a 100 mL water sample and determines if drinking water poses a health risk. Ideal for on-site testing in low resource and disaster settings, the CBT can be used by anyone, anywhere without the need for electricity, a cold chain, lab sample analysis and processing, expensive equipment and trained technicians. With the CBT, water quality testing and monitoring are accomplished with little training using easy steps that generate visual, color change results. The CBT has versatile applications for low resource settings and household level testing for developing countries, disaster settings, water utilities, agricultural waters, recreational waters, surface waters and private wells.		WASH

Technology Provider	Contact Information	Brief Description	Images	Category
Cascade Designs, Inc.	Laura McLaughlin laura.mclaughlin@cascadedesigns.com (206) 707-3984  (Not Pictured) Ignas Remgijus Gaska, Sensor Electronic Technology Inc. ignas@s-et.com (803) 917-9732	SE200: The SE200 is a "coffee-mug" sized chlorine generator that converts table salt and water into a liquid chlorine solution (bleach). In five minutes, it produces enough chlorine solution to treat 50 gallons (200 liters) of water, with table salt and either wall power or a 12 volt car battery as its only consumables. UV LED Technology: The UV inactivation process is essentially instantaneous, highly effective at removing chlorine-resistant protozoa, doesn't affect the taste of the water, and has no chemical consumables. Light emitting diodes (LEDs) offer improved performance in the field over UV disinfection systems that employ mercury lamps since UV LEDs emit light in the optimal germicidal wavelength region, possess a 10 year working life, and are far more durable than most treatment options.	 	WASH
dloHaiti[11]	Hilary White hilary@dlohaiti.com	Combines an energy-efficient decentralized water treatment technology and a franchise entrepreneur distribution model to improve water quality access while reducing carbon emission.		WASH

[11] Was selected as an exemplar technology but was unable to make it to the U.S. State Department for the event.

Technology Provider	Contact Information	Brief Description	Images	Category
Idaho National Laboratories[12]	Jack Boyles jack.boyles@msn.com (978)-430-8407	Nano-Composite Arsenic Sorbent (N-CAS) technology treats dangerous arsenic concentrations in the drinking water.	No image provided	WASH
Innovative Water Technologies – Sun Spring	Daniel Ward dan@wardmg.com (480) 284-1304 	Sun Spring is a Decentralized Water Treatment Plant that purifies up to and exceeding 5,000 gallons per day of safe drinking water for up to and exceeding 10 years. The system provides people microbiologically safe drinking water, with the exact same technology we use here in the U.S. for our public drinking water. Sun Spring can be private labeled to display the U.S. Water Partnership, U.S. State Dept. or any other organization logo and can be set up and operational in just 2-3 hours. Each unit includes a power station and a four plug 12vdc charging station for charging cell phones, lap tops, tools, lighting, etc. Once installed, there are no daily fuel charges and the unit is 100 percent powered by free solar and wind technology.		WASH

[12] See dloHaiti above

Technology Provider	Contact Information	Brief Description	Images	Category
Lifewater Drilling	Bob Hather bob@lifewaterdrillingtechnology.com (805) 439-1542 	The LDT 360 water well drill rig is designed to specifically meet the challenges in developing countries with its robust capabilities, reliability, ease of operation and low cost.		WASH
ProCleanse	Michael Robeson mrobeson@procleansefilters.com (970) 481-6932 	Household water treatment and safe storage technology is a self-contained, two-chamber gravity filter with granular media. The media is composed of a ceramic material with an estimated 70 percent pore space and imbedded, positively charged metal ions. The filter operates by pouring raw water in the top of the container, through the media, and into the “safe water chamber.”		WASH

Technology Provider	Contact Information	Brief Description	Images	Category
Puralytics	Mark Owen Mark.owen@puralytics.com (503) 819-0901 	Puralytics SolarBag uses sunlight-activated nanotechnology to deliver clean potable water, addressing the World Health Organization and U.S. EPA guidelines for safe drinking water, killing pathogens, destroying chemical contaminants, and removing heavy metal toxins. No electricity, chemicals, filters or membranes are needed. This totally passive purification product is perfect for short and medium term drinking water in rural and peri-urban environments, disaster response, international travelers, is self-cleaning and can be used 500 times.		WASH

Technology Provider	Contact Information	Brief Description	Images	Category
Oswald Green Technologies	Bailey Green BGreen@GO2WaterSolutions.com (510) 282-8947) 	Oswald Green Technologies, Inc. (OGT) offers a proven, sustainable wastewater treatment and resource recovery technology developed in the U.S. and now being commercialized by a U.S. water technology company. Advanced Integrated Wastewater Pond Systems (AIWPS™) address the basic human need for safe drinking water and sanitation by harnessing the power of the ancient algal-bacterial symbiosis. Because of their ecological efficiency, AIWPS® wastewater treatment facilities (WWTFs) are simple to operate, reliable and affordable. The AIWPS™ Technology tackles key global water challenges including waterborne disease, water recycling, water scarcity, water security, water-energy efficiency, renewable energy production, nutrient recycling, food safety, the restoration of surface water and groundwater, wetlands habitats, and aquatic ecosystem services.	 	WASH

Technology Provider	Contact Information	Brief Description	Images	Category
Floating Island Solutions	Rob Crook crookkohler@bellsouth.net 919-260-5082 	Applies green infrastructure to improve water quality especially for stormwater and wastewater lagoons. The BioHaven™ Floating Islands biomimic natural wetlands thus utilizing the principles that nature uses to clean vast quantities of water. These highly flexible tools are becoming the engineered platform of choice to clean wastewater, stormwater, landfill leachate, and in-situ restoration of lakes and rivers in many parts of the world.	 	IWRM

Technology Provider	Contact Information	Brief Description	Images	Category
In-Situ, Inc.	James Broderick jbroderick@in-situ.com (307) 760-4321 	The SMARTROLL™ Multiparameter and RDO™ Handhelds combine industry-leading water quality sensors with the industry's first water monitoring smartphone app. The SMARTROLL Handheld's battery pack wirelessly transmits results to your smartphone and the unique In-Situ® App guides you through sampling steps, calibrations, and data collection. In-Situ Inc.'s Rugged Dissolved Oxygen (RDO®) Sensor measures DO with patented optical measurement technology. In-Situ Inc.'s U.S. Environmental Protection Agency (EPA)-approved optical dissolved oxygen methods differ from traditional electrochemical methods (Clark cell, galvanic sensor), by eliminating the use of membranes and filling solutions. The Aqua TROLL® 200 Data Logger is an intelligent probe that measures and logs conductivity/salinity, water level/pressure, and temperature data for long-term groundwater and surface-water monitoring.	  	IWRM

Technology Provider	Contact Information	Brief Description	Images	Category
PaveDrain	Doug Buch (414) 630-1012 dbuch@pavedrain.com 	Permeable system that infiltrates stormwater at an unprecedented rate with minimal, if any, maintenance. Individual concrete blocks are manufactured regionally and can be installed by hand or as a mattress.		IWRM
Badger Meter	Kristie Anderson kanderson@badgermeter.com (262) 617-9698 	Badger Meter presents BEACON Advanced Metering Analytics, a system for capture and communication of water meter reading data that leverages existing cellular networks to transfer data, providing greater reliability compared to other metering technologies, enabling rapid deployment, and minimizing infrastructure costs. BEACON AMA employs a powerful software suite, including web portals and a consumer app, to analyze and present that data, providing the utility and its end water consumers with water usage information that is easy to access, understand, and act upon.		Monitoring

Technology Provider	Contact Information	Brief Description	Images	Category
SweetSense, Inc.	Dexter Gauntlett dexterg22@gmail.com	Small, compact, integrated and low power monitoring system that provides real-time data that can optimize water system performance.		Monitoring

Appendix B: Nine Step Assessment Methodology

Step 1: Engage a core cadre of experts and leading water technology organizations – The Partnership engaged a core group of experts from the private sector, civil society, technology and research organizations and U.S. government agencies to develop a call for information with key performance indicators (KPIs) to guide the selection of the exemplar U.S. water technologies.

The KPIs and the assessment process were designed for multiple water technology contexts in both the developing and developed world and diverse applications which address water-nexus issues such as drinking water treatment, wastewater treatment, energy efficiency, utility management, agriculture irrigation, etc. A complete list with definitions of the KPIs can be found in Appendix C.

Step 2: Issue the call for information – This call was sent on January 9, 2014 to Partnership members and numerous professional water associations, water technology clusters, universities and federal agencies. Submissions were originally due on January 27, 2014. Due to the strong interest from potential applicants, the U.S. Water Partnership extended the deadline to February 4, 2014. Forty-six (46) total applications were received.

Step 3: Establish an independent review panel – Eleven experts were selected by the Partnership Secretariat based on their diverse range of expertise from U.S. government agencies, professional associations, private sector, universities and NGOs. The selected reviewers notified the U.S. Water Partnership Secretariat of any potential conflict of interest on a particular technology and did not rank any such technology. A complete list of the independent review panel can be found in Appendix D.

Step 4: Cross-section review of technologies – Each reviewer was randomly assigned twelve to thirteen applications to ensure a more thorough and balanced assessment. For each application assessed, the reviewer provided:

- *KPI-Weight Matrix* – which calculated the importance of each KPI on a scale from 1-9;
- *Technology Assessment Matrix* – which calculated a quantitative score on how well the technology met each KPI on a scale from 1-9 and a qualitative response to eight questions prompted in the technology assessment package.

Step 5: Compile and synthesize the results – Figure 2 illustrates how a technology's total score was calculated by summing the average scores from the reviewers across the 16 KPIs. The reviewers rated how well the technology met each KPI, and this score was then multiplied by the reviewer's KPI weighting for the technology score (E). The highest total score possible was 1,296 [9 (KPI Weight) x 9 (Tech Score) x 16 (each different KPI category) = 1,296].

Figure 2: Technology Assessment Score

APPLICANT	Total Average Score (A)	Beta Tested (B)	S.D.	U.S. Developed (C)	S.D.	Water Quality (D)
Technology 1	621	69	13.7	78	5.2	27
Reviewer 1	835	72		72		81
Reviewer 3	483	81		81		0
Reviewer 11	545	54 (E)		81		0

A = Total Average Score TECH1= SUM [AVERAGE SCORE (B + C + D + etc.)]

B = AVERAGE $(TECH1SCORE_{R1}, TECH1SCORE_{R3}, TECH1SCORE_{R11})$

E = TECH1 $SCORE_{R11} = (KPI1WEIGHT_{R11} \times KPI1SCORE_{R11})$

Furthermore, the qualitative feedback was captured by the reviewer's response to the following key questions:

- Do you recommend this technology as an exemplar technology?
- What is innovative about this technology?
- Please identify any risks or "red flags" associated with the technology?
- How well does this technology address water nexus issues?
- What are the main benefits of the technology?
- How well did the technology meet the majority of the KPIs?
- What KPIs were missing?

These qualitative results were collected and assessed to identify trends and cross-referenced with the quantitative assessments. The list of recommended exemplar technologies reflects the combined quantitative and qualitative responses from the independent review panel.

Sensitivity testing confirmed the variation in the scores was attributed to the reviewer's score of how well the technology met the KPIs and not a bias from the KPI-weight ranking. High standard deviations across the technology scores identified the technologies that needed additional review and discussion. These were discussed later in the follow-up conference call with reviewers (see Step 6).

Combining the quantitative and qualitative assessments allowed the 46 technologies to be categorized into three groups, which included:

- "YES" – There were 23 technologies categorized as "YES" because there was consistency between a high quantitative score[13] and the qualitative responses as a recommended technology with no serious red flags or risks.
- "NO" – There were ten technologies categorized as "NO" because of either a low quantitative score and/or qualitative responses that reached consensus not to recommend as exemplar.

[13] A score was categorized as high if it was above the average 563 score

- "DISCUSS" – There were thirteen technologies categorized as "DISCUSS" because these technologies required further assessment due to several findings, which included:

    - The technology had significant variation among the reviewers' quantitative scores;
    - The technology showed a slightly lower than average quantitative score but positive qualitative results; and
    - There was no consensus among the qualitative responses, where one reviewer may have recommended the technology as exemplar but another may not have and/or identified red flags.

Step 6: Hold a conference call to build consensus – A two-hour conference call was held on February 27, 2014 to discuss the results. The reviewers confirmed the slate of technologies in the "YES" and the "NO" categories and further looked at the "DISCUSS" technologies. Upon additional review and discussion, the independent review panel moved the technologies in the "DISCUSS" category to either the "YES" or the "NO" categories. During the call, the reviewers also agreed to share feedback on the innovativeness for the list of selected exemplar technologies. This discussion resulted in panel recommendations for 28 technologies from 25 organizations, with some organizations having multiple technologies selected.

Step 7: Provide recommendations to the U.S. State Department – The final list of the 25 recommended exemplar technology providers, available in Appendix A, was selected by the independent review panel and shared with the U.S. State Department.

Step 8: Approve the recommended technologies and organizations – The U.S. State Department reviewed the 25 recommended technologies and organizations, all of which were invited to participate at the event on March 21, 2014 in Washington DC.

Step 9: Send invitations to selected technologies – The Partnerships engaged the selected organizations to participate in USTechH2.O. Ultimately, 23 of the 25 invited technologies participated in the event at the U.S. State Department on March 21, 2014.

Appendix C: Key Performance Indicators and Definitions

1. **Beta-Stage Technologies**[14] – The technologies should be at or beyond the beta stage, ready for scale up and appropriate for urban and/or rural applications. Products that are already commercially available, beginning to penetrate the market or have been deployed in the field by the U.S. Department of Defense or other organizations are also appropriate.
2. **U.S.-Developed** – The technologies should be developed by U.S. firms. A U.S. entity should employ U.S. citizens in more than half of its permanent full-time positions in the U.S.
3. **Water Quality** – The technical performance of the product should produce or maintain water quality that meets or betters appropriate standards such as U.S. Environmental Protection Agency (U.S. EPA) or the World Health Organization. The technologies can address a range of contaminant treatment areas such as bacteria, brackish waters, metals, turbidity etc. Testing by a recognized organization such as U.S. EPA, National Science Foundation International, International Association of Plumbing and Mechanical Officials (IAPMO) or Water Environment Research Foundation (WERF) is a major plus. Water quality and quantity monitoring technologies should also be appropriately considered.
4. **Professionally Recognized** – The technologies that have already been identified as well performing or promising by engineering, plumbing and development professionals will be good candidates (e.g., Imagine H2O, U.S. EPA Environmental Technology Verification Program (http://www.epa.gov/etv/) and USAID reports).
5. **Addresses Multiple Issues** – Of special interest are technologies that provide benefits in more than one aspect of the integrated issues of water, energy, food and health (for example, a renewable energy powered water treatment technology, or a water treatment technology that recycles water and nutrients for agriculture).
6. **Operational Sustainability** – The product should have the demonstrated capability to provide reliable, cost-effective operations over an extended period of time in difficult conditions. This would include being capable of dealing with interruptions in power supply, variations in water quality, infrequent maintenance etc. Other indicators of operational sustainability include, but are not limited to, the following:
    a. **Capacity target** – How much water will be treated before maintenance, resupply, or replacement?
    b. **Flow rate target** – How long will it take to fill a cup of water, a cooking pot or a 20 liter jerry can?
    c. **Shelf-life** – How long will your technology last in a warehouse?
7. **Safety** – The technologies should be designed to protect users and operators from electrical shock, breakable components, sharp edges, hazardous materials, etc.
8. **Simplicity** – The product should be simple to construct, operate and maintain. This includes access to spare parts and supply chains in developing countries.
9. **Low Cost** – The cost effectiveness of technologies vary with scale/volume, but in general it should be a small investment relative to the potential benefits. This should include storage costs.
10. **Low Energy Use** – The technology should exhibit an appropriate combination of renewable energy, energy efficiency, low energy use or capability of efficient energy production. Does your technology require a battery? Can it operate from multiple power sources, if needed (solar, car battery or wall power)?

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[14] Beta stage technologies are similar to the Department of Defense (DoD) and the Department of Energy's (DoE) Technology Readiness Level (TRL) 6 – "system/subsystem model or prototype demonstration in a relevant environment" or TRL 7 –"system prototype demonstration in an operational environment." Please see DoD *Technology Readiness Assessment Guidance* 2011 and DoE *Technology Readiness Assessment Guide* 2011.

11. **Rapid Deployment and Installation** – The technology should be designed either as a complete system (e.g., self-contained power supplies, process piping, etc.) or be designed as a plug and play component to an existing system for rapid setup/startup time.
12. **Limited Downtime Risk** – There should be a backup system or plan that will prevent public health hazards or other risks in the event of a breakdown or outage.
13. **Durability** – Field deployment frequently means exposure to temperature and moisture extremes, vermin, theft and vandalism, etc.

Appendix D: Independent Review Panel

1. **Dr. Stuart Asay, P.E.**, *International Association of Plumbing and Mechanical Officials (IAPMO)*
2. **Bruce Bartley, P.E.**, *NSF International*
3. **Paul Bizier, P.E**, *American Society of Civil Engineers (ASCE), Barge Waggoner Sumner & Cannon, Inc.*
4. **Scott Bryan**, *Imagine H2O*
5. **Dr. Neil Grigg, P.E.**, *ASCE, Colorado State University*
6. **Mike Hightower, P.E.**, *U.S. Department of Energy, Sandia National Laboratories*
7. **Dr. E. Zia Hosseinipour, P.E.**, *ASCE, Ventura County Watershed Protection District (CA)*
8. **Will Kirksey, P.E.**, *Independent Consultant*
9. **Jeff Moeller, P.E.**, *Water Environment Research Foundation*
10. **Dr. Kalanithy Vairavamoorthy, P.E.**, *Patel College of Global Sustainability, University of South Florida*
11. **Dr. Jim Zhou, P.E.**, *ASCE, Southern Illinois University*