EXCELLENCE IN DESIGN

The smart water revolution

External innovators can lend great impetus to new product development. By teaming up with just such an external partner – TaKaDu – ABB can now, in addition to its existing water business portfolio, offer water utilities solutions that leverage the full potential of digitization.

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Hugh Courtney, President of the International Partnership of Business Schools, a consortium of leading business institutions that aims to elevate global business education, is credited with saying, “in a globally competitive economic environment, the only source of sustained competitive advantage has to come through innovation.” Traditionally, the innovation that is so vital for new business development came from inside the business. In recent years, however, the speed, depth and complexity of technological development have forced enterprises to rethink their approach to innovation and seek inspiration from outside the company. In many cases, collaboration with external agents has become an indispensable strategy when trying to stay ahead of the competition. ABB has long followed such a path, with notable success.

The World Bank estimates global water loss due to leaks and bursts at 25 to 30 percent, representing a $20 billion cost savings opportunity.

In 2009, external collaboration was taken to a new level with the formation of ABB Technology Ventures (ATV), ABB’s strategic venture capital investment arm [1]. Based in Zurich, Switzerland, Silicon Valley and Chennai, India, ATV partners and invests in breakthrough technology startups that drive strategic value for ABB.

ATV’s partnership with TaKaDu, which dates from 2012, provides a perfect example of how an ATV investment can lead to a better offering and new customers.

Let's talk water

Water presents some of the world's most pressing social, political and economic challenges, and water crises rank among the top ten global societal risks in terms of impact, according to the World Economic Forum's Global Risks Report 2018 [2].

More concretely, the UN predicts that half of the world's population will not have access to clean water, enough water or water at all by 2030 should consumption and pollution issues not be adequately addressed. The factors contributing to more demand for water, such as climate change, population growth, new ways of living - and thus changes in domestic, commercial and industrial water consumption - are amplified by factors on the supply side.

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AMIR PELEG - "THE HI-TECH PLUMBER"

At 51, Amir Peleg, who likes to call himself, "the hi-tech plumber," has a string of successful startups under his belt, among them YaData Ltd. (novel technology for behavioral targeting; acquired by Microsoft), Unipier Ltd. (formerly Cash-U) and EVS, (Elbit Vision Systems) Ltd. He founded TaKaDu Ltd. in 2008.

Amir Peleg holds a B.Sc. degree in Mathematics, Physics, and Computer Science from the Hebrew University of Jerusalem and an MBA from INSEAD (Institut Européen d'Administration des Affaires or European Institute of Business Administration), Fontainebleau, France - a graduate business school. As a youth, Amir Peleg won a special prize for young inventors from the Weizmann Institute, Israel. He is also Chairman of SWAN, the Smart Water Networks Forum.

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On top of inadequate infrastructure investment, the World Bank estimates global water loss due to leaks and bursts at 25 to 30 percent, representing a $20 billion annual cost savings opportunity. Typically, utilities either have no data, or if they have it, they do not analyze it, depriving themselves of visibility into their water network. Repairs are carried out reactively and rarely in a planned way. Often, the first indication of trouble is when a concerned citizen reports water flowing down the street.

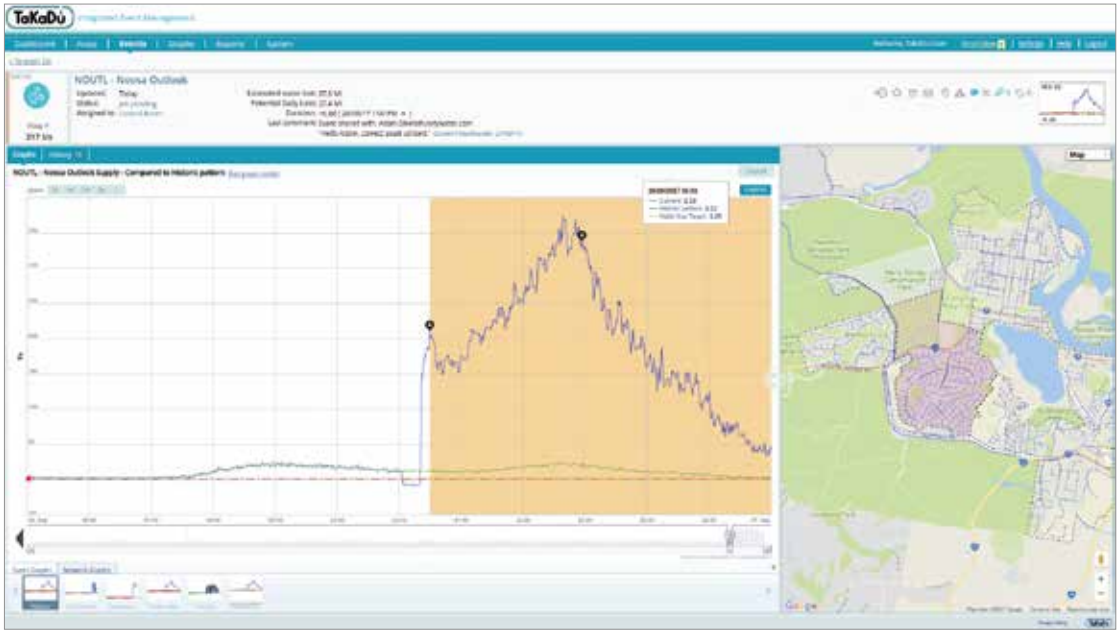
TaKaDu's solution analyzes and processes data that is captured by various smart sensors in the system equipment.

TaKaDu technology to save the day

The good news is that new technologies can help to solve the problem. By using digital technologies, data analytics and algorithms based on artificial intelligence (AI), utilities and cities are better equipped to manage demand for, and supply of, clean water and thus extract more value from their physical water infrastructure. Amongst the pioneers introducing these new technologies into the water industry is an Israeli company with which ABB's ATV has gone into partnership: TaKaDu [1].

According to Amir Peleg, Founder and CEO of TaKaDu, no one takes water for granted in Israel – a country in which water is in very short supply indeed →1. In fact, about 50 percent of Israel's drinking water comes from desalination plants – an expensive option – with agriculture irrigation using recycled wastewater (over 85 percent of Israel's wastewater is reused, the highest percentage in the world).

The trigger for Amir Peleg's venture into the water industry came around the time in summer 2008 when he had to reduce his own water consumption due to regional drought. He then found out that the local utilities were losing 15 to 20 percent of the water they were pumping into the network. On top of this, a chance conversation with an engineer brought home to Amir the realization of the inefficient situation in which many water utilities find themselves: Though they lose, on average, 25 to 30 percent of their water and collect a substantial quantity of raw data pertaining to their leaky water networks, very little use is made of this data to provide insight into the state of the water system or to support decision making. From this epiphany, TaKaDu was born.



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02 TaKaDu data analytics example.

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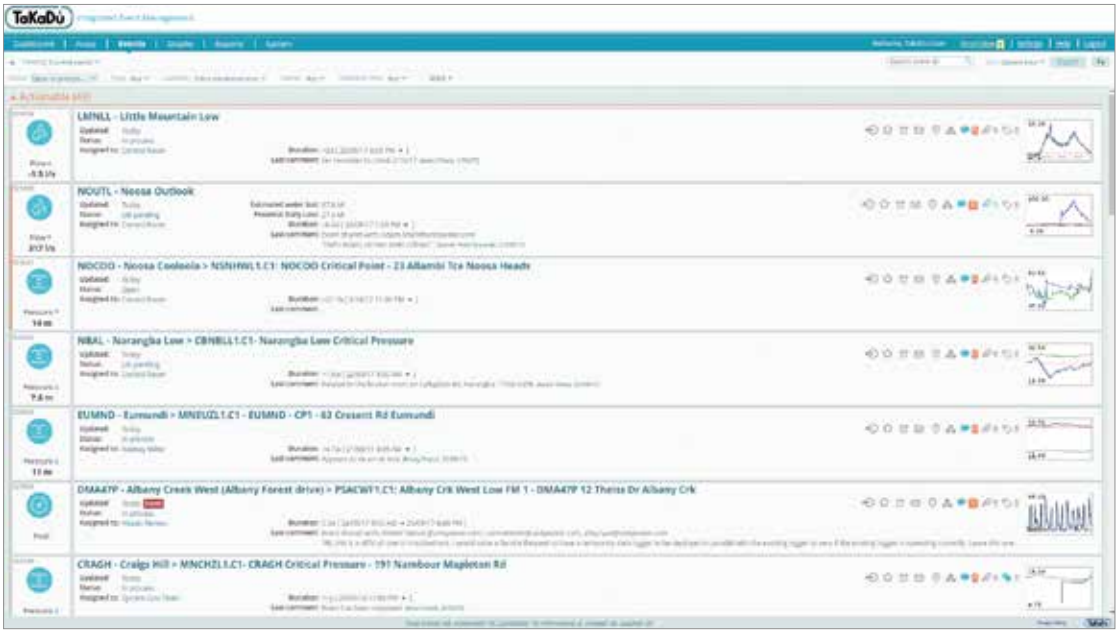
03 TaKaDu event management example.



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Pipeline processing

Amir Peleg and his team started to develop algorithms and use statistical approaches to detect leaks and prevent big bursts in the water networks. TaKaDu's solution analyzes and processes data that

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Multiple data sources are tapped by TaKaDu's patented, cloud-based SaaS to monitor optimal capacity, detect issues in the pipes, meters, valves, and other apparatus, and alert in real time on network faults.

is captured by various smart sensors in the system equipment. These multiple data sources include inputs from network operation and supervisory systems (eg, SCADA), online sensor-based flow meters, pressure data and other external influencers such as weather and calendar events.

The data is then used in TaKaDu's patented, cloud-based SaaS (software-as-a-service) to monitor optimal capacity, detect abnormal behavior of the data classify these as issues ("events") in the pipes, meters, valves, and other apparatus, and alert in real time on network faults. While game-changing for utilities and smart water management, the solution does not require network changes, additional devices or capital expenditure. In summary, TaKaDu's approach can predict, detect, analyze and manage water network events, thus reducing costs and increasing visibility and efficiency →2-5.

How does TaKaDu's technology work? For each water network, or part thereof, the software determines a baseline of normal patterns. For example, it understands the pattern of the water flow by the time of the day, the weekday, the season, etc., and learns, for example, that demand is highest in the mornings and evenings before people go to or after they return from work; and that behavior is different over the weekend or during holidays. The more information that is available about normal water usage behavior, the more precisely the software can detect anomalies such as leaks, a burst or even water theft. At Yarra Valley Water, a utility in Melbourne, TaKaDu's software detected unusual activity at a fire hydrant; when officials turned up at the location they found a strawberry farmer extracting water from the hydrant.

A critical innovative step achieved by TaKaDu was to look at the whole process as managing different types of events and combining all information and knowledge about them in a single interface. To put it in Amir Peleg's words: "In a similar way to how customer relations management (CRM) software drives business relationships with customers in today's enterprise, integrated event management integrates all the data layers a utility has about its network into a single knowledge layer about every incident."

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The in-depth visibility, real-time detection and quick insights gained into every type of event include the identification of:

- Leaks before they turn into large bursts
- Changes and trends in water pressure or supply interruptions
- Anomalous usage patterns or water theft
- Water quality issues
- Faults in meters, valves, PRVs (pressure reducing valves) and other assets
- Telemetry and data availability issues
- Automatic early warning of operational issues, like open valves and zone breaches.

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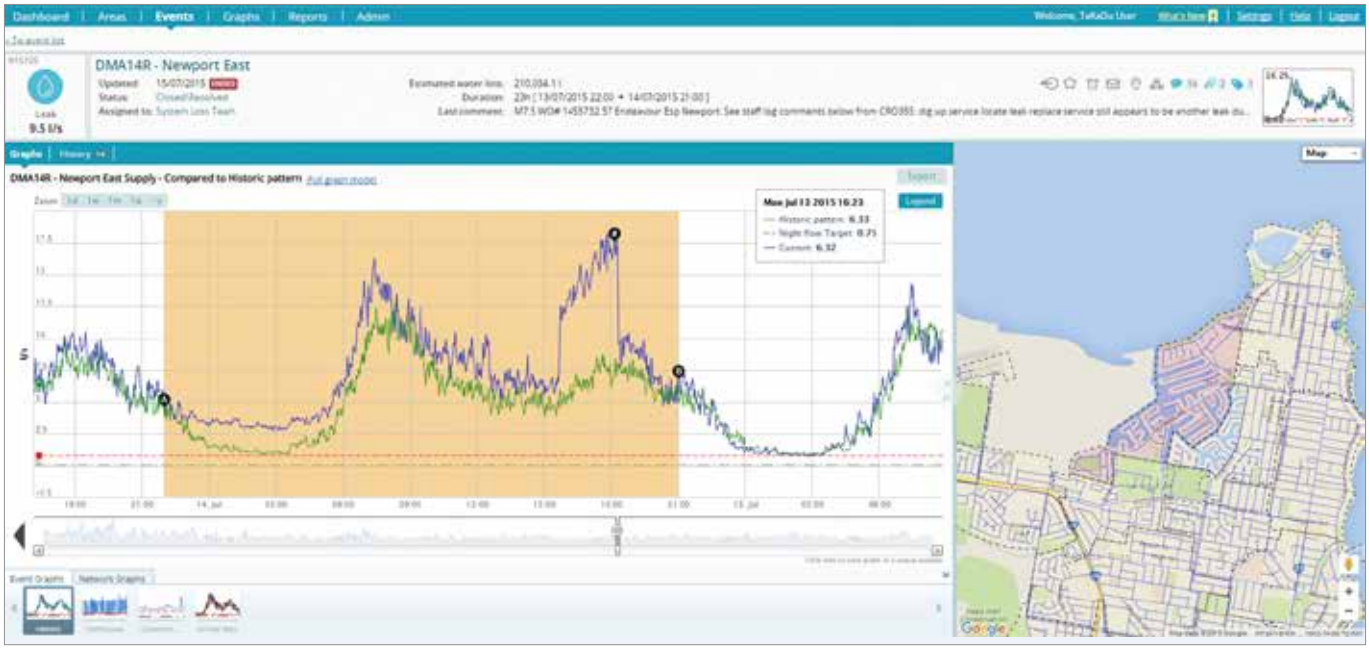

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04 TaKaDu sample management dashboard.

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05 TaKaDu - Typical leak event. Whereas ABB supplies instrumentation, control systems, sensors and measurement products, TaKaDu delivers an AI-based solution that provides early warning of the most likely leakage scenarios and tells the customer the optimal placement of the minimal number of pressure sensors.

According to Amir Peleg, many utilities are in a gray zone – they have some sensors and some analytics, and they ask why they should put in more sensors. But once they see the power of TaKaDu's product, they change their minds. The tailwind they get kicks off a positive feedback investment cycle.

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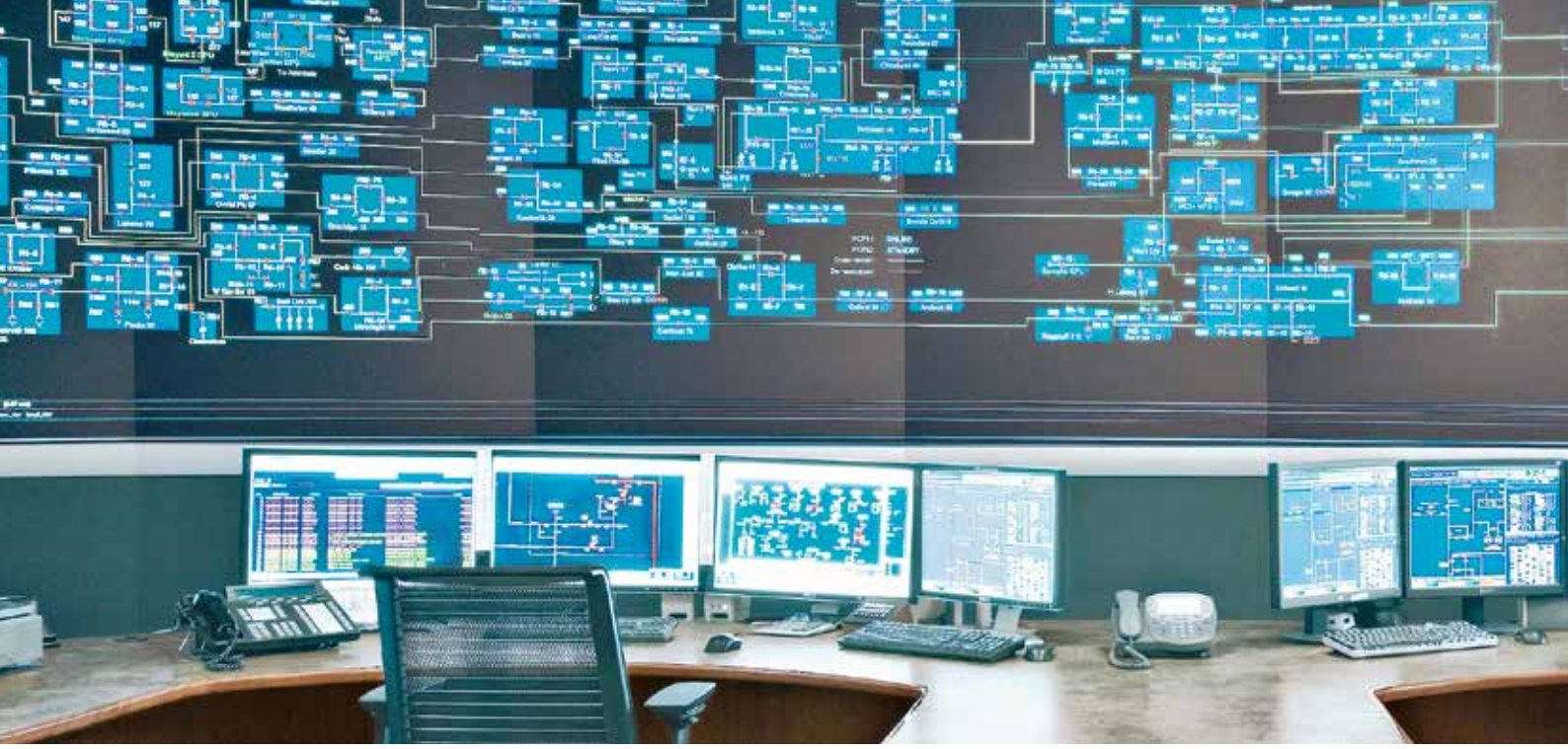
Complementing ABB's automation portfolio for the water sector, TaKaDu gives ABB access to its field-proven monitoring system, which has been widely adopted by water utilities.

Ho Chi Minh City

Complementing ABB's automation portfolio for the water sector, TaKaDu provides its field-proven monitoring system, which has been adopted by water utilities around the world. TaKaDu's innovations allow ABB's customers to produce, transport, distribute, treat and utilize water efficiently, reducing energy consumption, minimizing losses and improving reliability.

"TaKaDu's AI-based solution enables the water industry to catch the wave of digitalization for their sector just in time," says Kurt Kaltenegger, Head of Technology at ATV. "By partnering with TaKaDu we can show the full potential of advanced automation and the use of data to our customers in the water industry." While TaKaDu's solution helps to convert raw data into knowledge, ABB's long experience, established technology and broad customer base offer TaKaDu access and reach.

The powerful ABB/TaKaDu symbiosis is being put to work, for example, in a massive urban project to increase efficiency, reduce water leakage, prevent disruptions and ensure everyone has access to clean water in Ho Chi Minh City – a city that currently loses nearly 50 percent of its potable water to leaking and damaged pipes.



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The Saigon Water Supply Corporation (SAWACO) is deploying ABB's digital control and monitoring technologies together with TaKaDu's Integrated Event Management Solution as part of its restoration of Ho Chi Minh City's water distribution network.

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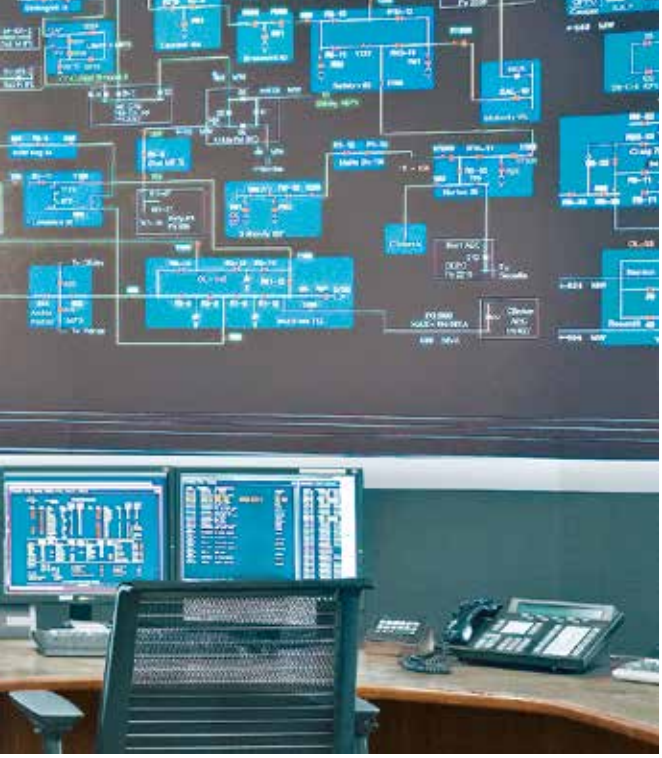
The ABB solution – ABB Ability™ Symphony® Plus SCADA – will monitor and control the entire water distribution system and integrate TaKaDu's Event Management solution, which detects, analyzes and manages network events and incidents such as leaks, bursts, faulty assets, telemetry and data issues, and operational failure →6.

ABB's and TaKaDu's complementary solutions will enable SAWACO to monitor the network conditions digitally through multiple data collection points, such as sensors and meters, and offer actionable insights to reduce non-revenue water. SAWACO will then be able to increase the amount of water delivered to the city's industries and eight million residents →7. At a first estimate, SAWACO will hit 50 Mio m^3/year of water savings - equivalent to 20,000 Olympic-size swimming pools - while annual production cost savings could exceed $10 million.

"We're excited to partner with ABB on this project in one of Asia's most dynamic countries," said Amir Peleg, "By converting raw data into knowledge, we can help SAWACO reduce hundreds of thousands of cubic meters of non-revenue water lost per day while significantly improving operational efficiency."



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06 Water network management is just one application of SCADA. Over the years, ABB's SCADA has evolved to fit specific business needs in many different areas.

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07 TaKaDu's technology transforms a water utility's approach to crisis management from one of ad hoc reaction into one that is data-driven and with more efficient decision-making.

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References
[1] V. Lietha, "In search of strategic innovation and collaboration," ABB Review 1/2018, pp 8-12.

[2] World Economic Forum, "The Global Risks Report 2018." Available: https://www.weforum.org/reports/the-global-risks-report-2018.

[3] www.takadu.com

Charting future waters

From its successful beginning, TaKaDu's technology has gone from strength to strength. The company has transformed water utilities from being reactive entities with ad hoc crisis management into data-driven, efficient decision-makers. TaKaDu's technology is now deployed in 12 countries worldwide, including Australia, Brazil, Chile, Israel, Romania, Spain and the United States, and customers include every type of water utility: small, super-large, rural, urban, private and public.

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TaKaDu's solutions have been internationally recognized as environmentally friendly technology.

TaKaDu's solutions have been internationally recognized as environmentally friendly technology - even winning the Technology Pioneer award from the World Economic Forum. TaKaDu also participated in a panel that discussed water scarcity in front of world leaders at the annual meeting in Davos. However, it was investment in the company that allowed its vision to evolve. On that note, on May 21, 2014, ATV won the Global Corporate Venturing award in the Sub-$50-million Investment of the Year category for its investment in TaKaDu. The awards celebrate innovation, best practice and service in the corporate venturing ecosystem. Among others in the running in the category were Google Ventures, Amex Ventures, Intel Capital, and Nike – further distinguishing ABB as an internationally recognized, innovative and strategic leader and underlining that the ABB/TaKaDu collaboration is a clearly successful and symbiotic relationship. ●

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