



THIRSTY ENERGY UPDATE

BACKGROUND

The Water-Energy Challenge

Significant amounts of water are needed in almost all energy generation processes, from generating hydropower, to cooling and other purposes in thermal power plants, to extracting and processing fuels. Conversely, the water sector needs energy to extract, treat and transport water. Both energy and water are used in the production of crops, including those used to generate energy through biofuels. Population growth and rapidly expanding economies place additional demands on water and energy, while several regions around the world are already experiencing significant water and energy shortages.

Today, more than 780 million people lack access to potable water (WWAP, 2014), and over 1.3 billion people lack access to electricity (IEA, 2012). At the same time, estimates show that by 2035, global energy consumption will increase by 35%, while water consumption by the energy sector could increase by 85% (IEA, 2012). Climate change will further challenge water and energy management by causing more water variability and intensified weather events, such as severe floods and droughts. Despite these concerns, current energy planning and production is often made without taking into account existing and future water constraints.

Thirsty Energy Initiative

In order to help countries integrate water constraints into the energy sector and better address water and energy challenges, the World Bank has launched the Thirsty Energy initiative. Thirsty Energy works to prepare countries for an uncertain future by:

- Identifying synergies and quantifying tradeoffs between energy development plans and water use;
- Piloting cross-sectoral planning to ensure sustainability of energy and water investments; and
- Designing assessment tools and resource management frameworks to help governments coordinate decision-making and enhance sustainable development.

Thirsty energy demonstrates the importance of combined energy and water management approaches through demand-based work in several countries. Thirsty Energy tailors approaches depending on the available resources, modeling experience, and institutional and political realities of a country. In order to ensure client ownership and successful integrated planning, thirsty energy focuses on building the capacity of relevant stakeholders and leveraging existing efforts and knowledge.



UPDATES

Communication and Knowledge Dissemination Strategy:

Launch of the initiative:

Thirsty Energy was officially launched on January 2014 at the joint closing session of the World Future Energy Summit (WFES) and the International Water Summit (IWS) in Abu Dhabi. The conference had over 25,000 attendees from over 130 countries including political, corporate and non-governmental leaders in energy from around the world. The launch also comprised a high-level panel discussion with Rachel Kyte (World Bank Group Vice President) introducing the initiative. The panel included H.E. Dr. Thani Ahmed Al Zeyoudi (Head of Directorate, Energy and Climate Change, Ministry of Foreign Affairs, UAE), Maria van der Hoeven (Executive Director, International Energy Agency), Torgny Holmgren (Executive Director, SIWI), William Rex (Acting Manager, TWIWA), Vivien Foster (Sector Manager, Energy Unit), Guillermo Bravo (VP, Abengoa), and Loic Duillet (VP, Alstom).

Extensive communications materials were prepared and distributed during the events, including [infographics](#) and a [brochure](#), to ensure the key messages of the initiative were being communicated effectively. There were several interviews and exchanges with media and the Bank also prepared a blog titled "[4 Ways Water Shortages are Harming Energy Production](#)," a [feature story](#) and [press release](#); and updated the Thirsty Energy [website](#) with additional material. During the launch, over 70 media sites and blogs had articles highlighting the initiative including an [article](#) in the Guardian Sustainable Business and [a blog](#) in Forbes Magazine. On Twitter, among many others, Fared Zakaria of CNN with 429,287 followers tweeted about Thirsty Energy; Green Energy News with 78,200 followers; the Guardian Sustainable Business with 64,700 followers, Environmental Defense Fund with 62,600 followers; IEA with 33,651 followers; McKinsey on Society with 22,072; and Alstom Power with 12,989 followers. From January 17-31, the online package received over 23,000 page views (an average of over 1,500 page views/day) and more than 500 publication downloads.

Events where the initiative was presented:

Thirsty Energy has been introduced in several events, raising awareness of the water-energy challenges and promoting a dialogue between government, international organizations and the private sector. The events are, among others:

- [XXVIII Annual Convention of the National Association of Water Utilities](#) (ANEAS in Spanish), Merida, Mexico (November 9-12, 2014)
- [World Water Week 2014](#), Stockholm, Sweden (August 31-September 05, 2014)
- [UN Sustainable Energy For All Forum](#) United Nations HQs, NYC (June 4 – 6, 2014)
- [African Utility Week](#), Cape Town, South Africa (May 13-14, 2014)
- [The Global Water Investment Summit](#), London, UK (May 7-8, 2014)
- [Nexus 2014: Water, Food, Climate and Energy Conference](#), Chapel Hill, USA. (March 5-8, 2014)
- [2014 UN-Water Annual International Conference](#), Zaragoza, Spain. (January 13-16, 2014).



Material published and disseminated

The first [working paper](#) of the initiative, Thirsty Energy, has been published and disseminated. It introduces the energy-water nexus, examines the water requirements of power generation and outlines some potential technical and institutional solutions for improving the management of the nexus.

Also, several communication materials have been prepared, including two sets of infographics in several languages, which have proven to be very successful to raise awareness of the topic. The messages have been picked up by the media and the general public, especially during events on water and energy. All the material (brochures, infographics, presentations, interviews, blogs, etc) can be found in the Initiative's website:

<http://www.worldbank.org/thirstyenergy>

Highlight: The thirsty energy infographics have been the most viewed infographics of the entire World Bank website in 2014 (see <http://blogs.worldbank.org/voices/globaldev-what-caught-your-attention-2014>) and the most retweeted material from World Bank water in 2014 (see <https://storify.com/worldbank/worldbankwater-year-in-review>)

Some examples of Thirsty Energy in the media:

- Actu Environment: [Quand l'énergie a soif : vers une gestion conjointe des ressources ?](#) (September 8, 2014)
- Ecosystem Marketplace: [World Bank Initiative Moves Talk On Water Energy Nexus To Action](#), Interview with Diego J. Rodriguez, Senior Economist (August 13, 2014)
- El Pais: [América Latina debe cuidar el agua para calmar su sed de energía](#) (August 11, 2014)
- OOSKA News: [Climate Change Critical to World Bank's Thirsty Energy Initiative](#) (May 27, 2014)
- Engerati: Video: [African Utility Water Week](#), Interview with Diego J. Rodriguez, Senior Economist (May 27, 2014)
- CNBCAfrica: [Africa's Power Story](#), Interview with Diego J. Rodriguez, Senior Economist (May 14, 2014)
- The Guardian: [Thirsty energy: the conflict between demands for power and water](#) (Feb 6, 2014)
- Forbes: [World Bank's Announcement of 'Thirsty Energy' Initiative Signals Growing Importance of Energy-Water Nexus](#) (Feb 5, 2014)
- [Interview with Diego J. Rodriguez](#), Senior Economist, Water Unit, The World Bank. “The World Bank’s Thirsty Energy initiative: Will water constrain our energy future?”

Collaboration with other organizations and institutions:

The energy-water challenge is too large for any organization to tackle alone. Thirsty Energy seeks to engage diverse partners and to share knowledge and best practices. The team collaborates with several international organizations working on the topic such as the International Energy Agency, UN Water, UN Sustainable Energy for All, GIZ, SIWI, etc. These collaborations, amongst other efforts, have led to the publication of more material on water and energy and on the initiative. For example:



- World Council of Civil Engineers and UN: [Water Monographs II: Water & Energy](#). (pages 14-23)
- [IFC HandShake](#): A quarterly journal on PPPs. Issue 13: Power. “[Thirsty Energy](#)” pages 38-41. (April 2014)
- Cornerstone Magazine. “[Thirsty Energy: Integrated Energy-Water Planning for a Sustainable Future](#)” pages 9-11. (Spring 2014)
- [The United Nations World Water Development Report 2014. Water and Energy](#). Volume 1 Chapter 5 “Infrastructure” pages 48-53 (March 2014)
- World Water Week 2013 Report, “[Thirsty Energy: Water for Power Generation – It’s not Only Hydropower](#)” page 40-44. (August 2013)
- Thirsty Energy is contributing to the UN SE4ALL Global Tracking Framework chapter on the Nexus.

Private Sector Reference Group

Due to the pivotal role of the private sector in the energy and water sectors, a Private Sector Reference Group (PSRG) has been established to share experience and knowledge, to provide technical and policy advice, and to scale-up outreach efforts. Abengoa, Alstom, Veolia and EDF are already members of the PSRG. This relationship goes both ways: For example, Abengoa has provided field data to Thirsty Energy modeling purposes and attended to Thirsty Energy workshops; but it has also used Thirsty Energy material in their [blog](#) and in a [presentation](#) by the CEO.

Thirsty Energy is also part of the International Technical Committee of the [Water for Energy Framework \(W4EF\)](#) Action Group. The main objective of this Action Group, led by EDF and supported by the European Innovation Partnership on Water, is to develop a common terminology and methodology to help energy actors assess the relations between energy production sites and local water environments.

Implementation of Work at the Country Level

There is ongoing work and dialogue in South Africa, Morocco, and China, and preliminary discussions in Mexico and Brazil. A summary is presented below:

SOUTH AFRICA

Background

- Water scarce country with stressed basins and strict water allocation
- Competition for water across sectors will increase – Power plants have priority, which could negatively affect other sectors such as agriculture
- Coal Thermal Power plants account for almost 90% of the power capacity installed. Fracking for Shale Gas is being explored, which will put additional pressure on water resources

Status

Thirsty Energy has partnered with the Energy Research Center (ERC) of the University of Cape Town to properly incorporate water constraints in their energy planning tools. The ERC has developed and maintained now for many years an energy optimization model for South



Africa (TIMES/MARKAL - SATIM). The ERC has been improving this modeling capacity and the model has been used to inform Eskom, Ministries of Water and Energy, National Planning Commission, and others, to design a series of national policies on energy, climate and other related issues. This model at the moment does not contain water as a constraining factor, nor does it include any water-related costs.

June 2013: First consultative meeting. During the meeting, the team discussed the most appropriate way to include water in the model, taking into account the regional and temporal differences between energy and water and including the price of water in the optimization. Terms of Reference were finalized and the following tasks were agreed on:

- *Task 1: Develop marginal water supply cost schedules.*
- *Task 2: Develop the “water smart” SATIM model*
- *Task 3: SATIM Energy-Water Nexus Model Simulations*
- *Task 4: Phase 1 Report on Integrated Energy-Water Analysis in South Africa.*
- The objective of this task is to document the work performed, the methodologies used, and the results obtained to ensure proper dissemination of the work. The report should contain the following 1) Summary of water-energy issues in South Africa, 2) Definition of the model, assumptions, methodology and data used - explaining data uncertainties, gaps, etc.- 3) Documentation of results and discussion of outcomes of the different scenarios, 4) Priority investment decisions and policy and institutional recommendations, 5) Gaps needing to be addressed in future research

January 2014: ERC [presented](#) a preliminary assessment at the 2014 UN-Water Annual International Conference

September 2014: the draft interim reports of Task 1 and Task 2 were prepared.

Next Steps:

May 2015: Mission to discuss preliminary results prior to the formulation of the final report.

December 2015: The final report (Task 4) is expected to be finalized.

Potential Phase 2

Based on results of this analysis, the World Bank might pursue further investigation of the effects of water scarcity in the energy sector through links between SATIM and an existing computable general equilibrium (CGE) model (E-SAGE).

MOROCCO:

Background

- Recent merge of power and water utility (ONEE) → potential for synergies and integrated planning
- Water constraints can impact growth, increasing competition for water across sectors (esp. irrigation); ambitious renewable targets for 2020 to meet 7% annual growth in electricity consumption; Climate change vulnerability



Status

Thirsty Energy is working with ONEE (recently merged water and power government owned utility) to identify synergies and evaluate tradeoffs between energy and water resource planning.

March 2014: First Stakeholder Workshop: ONEE's energy and water areas were recently merged with a mandate to improve the integrated planning and investments of energy and water. The objectives of the workshop were to 1) illustrate with cases from the United States, South Africa, and others, the experiences with water stress and the development of the energy sector; the merits of long-term integrated energy water planning and the identification of future challenges and potential opportunities, 2) learn from ONEE on the current planning and investment design frameworks in water and energy, and 3) to discuss the potential scope of the initiative's support to formulate an integrated vision for ONEE and the opportunity to broaden the scope to the entire water sector.

ONEE's authorities reiterated their support and interest in the initiative. A preliminary approach was defined at the conclusion of the workshop (See attached Proposed Approach_Morocco_Draft.pdf). Activities will be developed at two different levels:

- At the national level, focusing on the first national integrated energy and water vision, flagging potential future constraints, and including all relevant stakeholders in the government, private sector and others.
- At the utility level (ONEE), focusing on identifying synergies and integrated strategies to improve the efficiency of the utility.

Next Steps

Second Stakeholder Workshop: ONEE requested the organization of a broader stakeholder workshop (tentatively in April 2015) with participation of key organizations in water resources and energy from Morocco:

- Ministry of the Interior
- Minister of Energy, Mining, Water and the Environment
- MASEN
- Ministry of Agriculture and Marine Fisheries
- High Commission for Planning

The objectives of this workshop will be to: 1) present and discuss the proposed detailed approach for the implementation of activities and agree on a workplan, 2) to share global expertise and knowledge on topics raised during the first visit in March 2014 including integrated modeling, co-generation in desalination, renewables and desalination, water reuse for power, among others 3) discuss the detailed implementation of Thirsty Energy in Morocco including determination of the appropriate tools and associated data development and training needs, and 4) begin defining potential scenarios to be developed.



CHINA:

Background

- Recent efforts by the National Energy Administration (NEA) to assess water needs by the energy sector and integrate water resource constraints into the upcoming five-year energy plan
- Most of the energy resources in China are in water scarce areas and the NEA wants to understand the impact of water resources on energy development and vice-versa.

Status

The main objective of the activity in China is to support the NEA in its planning process and in its effort to integrate water resources in the five-year energy plan, and to assess the long term sustainability of the plan; identifying whether water resources are available to meet the needs of the sector expansion and ensuring that water resources are used efficiently and in a sustainable manner.

March 2014: First Stakeholder Meetings with NEA, Energy Research Institute, Institute of Water Resources and Hydropower Research, and Tsinghua University. During the meeting we discussed the challenges to integrate water and energy planning, including the regional and temporal differences between energy and water and the importance to match water basins with the energy areas and the administrative regions. It was agreed that the approach would be to build on an existing TIMES^[1] energy system optimization model of China by complementing it with the existing information from the water resource models at IWHR, creating a “water-smart” energy model. At the same time, information from the energy model will be used as input for the water models from IWHR, to ensure that their models have more accurate data on the energy sector water demand and location, creating a model that is much more realistic on the demands of the sector.

Next Steps

- Start Implementation
- Expected outputs:
 - May 2015: workshop/meeting to discuss progress and the technical inputs
 - June 2015: Preliminary Assessments to be shared with NEA
 - January 2016: Final Results and Report

Recently **Mexico** has expressed interest in Thirsty Energy conducting a workshop on the water and energy nexus, and **Brazil** has shown interest in conducting analysis on water-energy challenges. Dialogue in both countries is preliminary and ongoing.

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www.worldbank.org/thirstyenergy