Abstract: The energy / water nexus.

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Energy production depends on water. It is used in power generation, primarily for cooling thermal power plants; in the extraction, transport and processing of fuels; and, increasingly, in irrigation to grow biomass feedstock crops. Energy is also vital to providing freshwater, needed to power systems that collect, transport, distribute and treat it. Each resource faces rising demands and constraints in many regions as a consequence of economic and population growth and climate change, which will amplify their vulnerability to one another.

For the energy sector, constraints on water can challenge the reliability of existing operations as well as the physical, economic and environmental viability of future projects. Water constraints can occur naturally, as in the case of droughts and heat waves, or be human-induced, as a result of growing competition among users or regulations that limit access to water.

The IEA, for the first time in the *World Energy Outlook 2012*, has started to examine the water for energy relationship, reviewing water requirements for different energy sources and estimating total freshwater needs by scenario, energy source and region. The findings show that the scale of water use for energy production is tremendous. Some 580 billion cubic metres of freshwater are withdrawn for energy production every year. At about 15% of the world's total water withdrawal, the figure is second only to agriculture. To put it another way, the energy sector withdraws water at approximately the same rate that water flows down the Ganges (in India) or Mississippi (in the United States) Rivers – some of the very largest in the world.

In addition, climate change is set to modify water availability and puts extra constraints for the energy sector. What does this mean for future energy supply? Given the location-specific nature of water resources and climate change impact, this question must be considered at the water basin level, or even at particular sites. Power generation in parts of China, India and the United States will likely have to deploy more and more technologies fit for water-constrained conditions. And the development of unconventional oil and gas resources, which raises notable water-quality risks, will be challenged to follow high standards that commit industry to continually improving environmental performance. In most cases, water-related risks can be managed with existing technologies, though this can involve trade-offs in cost, energy output and project siting.