Reducing Energy Sector Vulnerability to Climate Change

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Context

The energy sector is sensitive to changes in seasonal weather patterns and extreme events that can affect the production and supply of energy, impact transmission capacity, disrupt oil and gas production, and impact the integrity of transmission pipelines and power distribution networks. Most infrastructure has been built to design codes based on historic climate data and will require decisions in coming years regarding rehabilitation, upgrade or replacement. Climate change also affects seasonal energy demand. These risks pose both challenges and opportunities for adaptation.

Addressing the adaptation challenge

The World Bank is piloting vulnerability and adaptation assessments for the energy sectors of select countries. The goal of this pilot program is to test approaches that can help countries and energy sector stakeholders develop policies and projects – future energy assets – that are robust in the face of climatic uncertainties, and assist them in managing existing energy concerns as the climate changes. Climate change vulnerability assessments find the opportunities to build in resilience for climate change at lower cost when planning and designing new energy infrastructure. This program sets the stage for future support and operations/ activities in pilot countries.

Methodology

The program tests a consultative framework for decision-making to support adaptation of energy infrastructure that is vulnerable to climate change. The framework is a first step to bring together policymakers, planners, asset owners, academics, and civil society to discuss a country's energy sector and the risks it may face from current weather and projected climate change.

The program uses a qualitative/semi-quantitative risk assessment approach to identify risks, adaptation measures, and their costs and benefits. It draws on experience and published guidance from the UK and Australia[1]. The climate vulnerability assessment puts stakeholders at the heart of the decision-making process and involves:

(i) Climate risk screening of the energy sector to identify and prioritize hazards, current vulnerabilities, and risks from projected climate changes out to the year 2050;
(ii) Identifying adaptation options to reduce overall vulnerability; and
(iii) High-level cost-benefit analysis of key physical adaptation options.

A first pilot (of two) is nearing completion in Albania, and a toolkit documenting the approach and methodology is under development for broader dissemination later in 2010.

[1] See also the Australian Government's work on Climate Change Risk and Vulnerability: Promoting an Efficient Adaptation Response in Australia[1], final report, March 2005 and other similar adaptation work done that may have been conducted in other countries.

Emerging results from Albania (note study is not yet finalized)

In Albania, hydropower currently provides about 90% of domestic electricity. While Albania's 'green' production capability is an increasingly important national and regional asset such a high dependence on hydropower also brings challenges. The country's rainfall, on which its hydropower depends, is among the most variable in Europe; hydropower production varies between about 2,900GWh in very dry years to twice that amount in unusually wet years. Coupled with this, Albania has limited regional electricity interconnections at present and imports are expensive. There are also significant inefficiencies in domestic energy supply, demand and water use. All these factors have compounded to create frequent load shedding and consequent impacts on Albania's economic development.

Unless prompt action is taken, runoff could reduce 20% by 2050 driven by climate change and could lead to 15% less electricity generation from Albania's large hydropower plants (LHPPs) and 20% less from small hydropower plants (SHPPs). At the same time, increases in extreme precipitation events could lead to increased costs for maintaining dam security. Nor are other energy assets immune from climate impacts from rising sea levels and increased rates of coastal erosion, as well as rising temperatures that will also affect energy demand. Higher temperatures due to climate change will reduce demand for space heating, particularly in winter, but will increase demand for space cooling and refrigeration in hotter months. The seasonality of Albania's supply-demand imbalance will become increasingly critical: as summer demand rises along with temperatures, hydropower production in summer looks set to be most affected by reduced rainfall. At the same time, demand for agricultural irrigation will rise, further competing with water demand for hydropower. Solar energy production in Albania may, however, benefit from projected decreases in cloudiness – it is estimated that output from solar power could increase by 5% by 2050.

Adapting to climate variability and change will become increasingly important for the Albanian energy sector. There are several critical actions that could be taken now – namely improving meteorological and hydro-meteorological monitoring, modeling and forecasting, and improving energy efficiency and demand-side management. These will help manage existing climate variability better and will build the country's resilience to climate change. Albania is on the brink of a significant opportunity: major investments in new energy assets are underway or being planned. Integrating adaptation measures into these can help ensure their climate resilience. As the electricity sector is privatized, Albania can consider how to structure incentives for adaptation; there will be opportunities for cost sharing between Government and the private sector. For development of new assets and upgrade of existing assets, the earlier that climate risks and resilience are considered, the greater the opportunities to identify financially and economically efficient solutions that will build the robustness of the energy system for coming decades.