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Maharashtra at the Crossroads

Berkeley Lab-Led Agreement Tackles India's Energy Shortage, Global Climate Change

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The Indian state of Maharashtra and its capital, Mumbai, face increasing pollution and more blackouts unless energy demands can be addressed efficiently. (Source photo by Mark Jacobs, EETD)

The Indian state of Maharashtra is at a crossroads. Its people endure frequent electricity blackouts due to a booming energy demand that far outpaces energy production. One solution is to build more coal-fired power plants, which are among the chief greenhouse-gas-emitting culprits of climate change. Another solution takes a different approach: reduce electricity demand, and the need for more power plants, by implementing energy-efficiency measures.

The latter choice may have an edge, thanks to a Memorandum of Understanding (MOU) facilitated by Berkeley Lab scientists that aims to export California's lessons in adopting energy efficiency strategies to the state of Maharashtra. Maharashtra leads India in energy consumption.

The MOU, which is the only one of its kind between energy regulators in the U.S. and India, was signed in December, 2007, by Pramod Deo, chairman of the Maharashtra Electricity Regulatory Commission; Berkeley Lab Director Steve Chu; Art Rosenfeld, Commissioner of the California Energy Commission; and Dian Grueneich, Commissioner of the California Public Utilities Commission.

"The idea is to meet a significant portion of Maharashtra's electricity growth through energy efficiency, not by building power plants," says Jayant Sathaye of Berkeley Lab's Environmental Energy Technologies Division (EETD), who engineered the collaboration with fellow EETD scientist Amol Phadke. In addition to facilitating the MOU, Berkeley Lab, one of the world's premier research institutions in energy and environmental technology policies, will provide technical support to Maharashtra's energy regulators and utility companies.

The collaboration is designed to help Maharashtra meet a 5,000-megawatt shortfall in energy production, which sparks power outages that hamstring the state's economy and force businesses to use polluting, back-up diesel generators. The signatories hope to help Maharashtra erase this deficit by sharing California's energy-efficiency programs and practices, which have been instrumental in restraining California's per capita electricity consumption to a level that is almost half the per capita electricity consumption of the U.S.

"This landmark agreement between our two states is a clear indication that the world looks to California for pioneering innovation in energy efficiency and climate change," says California Energy Commissioner Art Rosenfeld. "Exporting California's energy efficiency measures will result in more available power for Maharashtra, a cleaner environment, and reduced greenhouse-gas emissions."

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The document lays the groundwork for an exchange of expertise between the parties and for embarking on joint research activities. Together, they'll explore policies on energy efficiency, demand-side management, renewable energy development, innovative electricity regulation, and integrated resource planning, among other areas. Incentive programs that drive the adoption of compact fluorescent lamps, efficient industrial processes, solar water heaters, and energy-efficient refrigerators, electric motors, and irrigation pumps will be considered.

"The MOU will also help California, where we have a great concern in mitigating climate change," adds Sathaye. "India's energy consumption is growing at approximately nine percent per year. We need to help them find ways to solve this problem by slowing the building of more power plants."

Says Dian Grueneich, Commissioner of the California Public Utilities Commission (CPUC), "Energy efficiency is becoming more and more important as a tool to reduce greenhouse-gas emissions and at the same time adapt to a changing climate. The CPUC is looking forward to a productive collaboration with the Maharashtra Electricity Regulatory Commission, Berkeley Lab, and the CEC, and I look forward to working with my colleagues in India."

The agreement has its origins in a 2005 study conducted by Sathaye and Phadke that quantifies what the people of Maharashtra know all too well: the state suffers from a severe energy shortage. Located in southwestern India on the Arabian Sea, Maharashtra has a population of nearly 97 million people. It's the most developed state in the nation and serves as the financial and entertainment capital of the country. But the state's utilities only generate about 12,000 megawatts of electricity, far short of the 17,000 megawatts demanded by domestic, industrial, and agricultural sectors. Daily blackouts are a fact of life.

"When we saw this, we immediately thought of the blackouts forecast in California for the summer of 2001," says Phadke. "We also thought of the energy-efficiency solutions that helped California get through this period."

Soon after California's electricity crisis erupted, for example, the state unveiled the 20/20 energy conservation program, which gave customers a 20-percent reduction in utility bills if they achieved a 20-percent reduction in consumption. In addition, many customers qualified for a rebate by purchasing high-efficiency appliances. Analysis conducted by Berkeley Lab scientists determined that these measures were critical in avoiding blackouts.

But will similar solutions work in Maharashtra? There's good reason for optimism. Like California, Maharashtra is progressive when it comes to implementing energy efficiency practices, and its electricity regulatory apparatus is analogous to that of California's. With this in mind, Sathaye and Phadke brought the two states' energy commissions together, and mapped out a framework that fosters an open exchange of ideas.

"We'd like to take the energy-efficiency mechanisms that helped us prevent the rolling blackouts in the summer of 2001, and introduce them to other parts of the world," says Sathaye.



A collaboration spearheaded by Jayant Sathaye (left) and Amol Phadke of Berkeley Lab's Environmental Energy Technologies Division will share California's energy-efficiency know-how with the Indian state of Maharashtra.

(Photo by Roy Kaltschmidt, Creative Services Office)

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In Maharashtra, these mechanisms could yield wide-ranging dividends. Today, daily blackouts cripple the state's economic output, which suppresses sales tax revenues. In their 2005 study, Sathaye and Phadke determined that if the state invests enough in energy efficiency measures to stop the blackouts, then this investment will be more than recouped by a surge in sales tax revenues. In addition, this increased revenue could reduce Maharashtra's fiscal deficit by more than 15 percent.

Agricultural irrigation pumping is another drain on the economy. Farmers in Maharashtra receive free, state-subsidized electricity. This freebie often results in farmers pumping more water, and using more electricity, than they need. The Lab's 2005 study found that if the state reduces farmers' electricity consumption via more efficient irrigation pumps, then it will decrease a subsidy burden that exceeds \$1 billion per year. This, in turn, will allow officials to increase funding for much-needed education and healthcare programs.

Because of these and other looming problems, it's imperative that Maharashtra shore up its energy deficit as soon as possible. Fortunately, energy-efficiency strategies can be up and running quickly—sometimes in a matter of weeks—compared to the five to ten years it takes for a new power plant to come on-line.

The MOU is already in action. Berkeley Lab EETD scientist Ranjit Bharvirkar is currently in Maharashtra, where he's advising electricity regulators on implementing demand-response protocols, which save energy by shifting a consumer's electricity loads from peak times to off-peak times. And fellow EETD scientist Ed Vine, a leader in monitoring and evaluating the efficiency of utility companies, will train and provide assistance to Maharashtra's utility companies.

The next step in the collaboration is a workshop to be held in Maharashtra in March on energy efficiency and resource planning. The MOU is funded by the U.S. Department of Energy and the U.S. Department of State in support of the goals of the Asia-Pacific Partnership on Clean Development and Climate.

Additional information

More about Jayant Sathaye's research is at <http://industrial-energy.lbl.gov/node/234>