

Cleaner Coal through Computation

Stanford researcher uses Ranger to design better pollution controls



The W. A. Parish Plant, pictured above, is the largest coal plant in Texas. Texas has more coal-powered plants than any other state.

regions like the Arctic, where it enters the food chain. Fish and polar bears have been found with dangerous amounts of mercury in their systems, and the people of the Arctic show elevated levels of toxic metals that are correlated to birth defects and other ailments.

To better understand this process, Wilcox simulates the interactions of trace metals using the Ranger supercomputer at the Texas Advanced Computing Center. Her studies help to design and improve the technologies capable of removing these metals from the combustion process.

Using Ranger allows Wilcox to predict the behavior of these particles with more detail than is possible in a laboratory experiment. The supercomputer runs thousands of simulations to determine which materials, in which configuration, would make the best filtering device. On Ranger, these simulations take just hours or days to complete; using a desktop computer, they would take years.

In 2011, the Environmental Protection Agency plans to release updated regulations limiting the release of mercury and other heavy metals into the atmosphere. Power companies will be forced to adopt more efficient technologies to protect the environment and avoid fines, and Wilcox will be leading the way.

In the 1970s, chemicals from coal-fired power plants, specifically nitrogen oxide and sulfur dioxide, were reacting in the atmosphere to produce acid rain.

In response, the U.S. government placed new regulations on power plants forcing owners to install pollution control devices, called scrubbers, to extract dangerous chemicals from the smoke. In a matter of years, acid rain was significantly reduced.

Today, coal-fired power plants are still unsafe, according to Jennifer Wilcox, assistant professor of Energy Resources Engineering at Stanford University. She cites the high levels of mercury, arsenic and selenium being discharged from power plants as a serious health threat.

About 5,000 tons of mercury is released from coal-fired power plants each year. Scientists say that mercury travels long distances and winds up in remote

“The idea of ‘clean coal’ is not realistic. Coal will never be clean. But as long as we’re using it, we need to learn how to minimize its environmental impact.”

Jennifer Wilcox, Stanford University

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