

## ORNL's New Buildings Feature "Green Building" Principles

ORNL is attempting to "walk the talk" in a facilities modernization campaign under way at the Laboratory. New buildings incorporate energy-saving and environmentally friendly features that make them more environmentally sustainable.

The building designs were evaluated by Leadership in Energy and Environmental Design (LEED®) principles developed by the U.S. Green Building Council. ORNL is aiming for a "silver" LEED rating, said Tim Myrick, the project coordinator.

As a first step toward sustainability, most of the new buildings were sited on a former parking area to avoid bulldozing undeveloped land.

On the outside, "cool roofs" that reflect solar rays reduce the energy needed for cooling. Trees will be planted to shade paved areas and avoid the creation of heat islands. Rainwater will be collected to water trees and landscaping. Parking lots will be partially paved with permeable asphalt through which rain can soak into the ground instead of running off into waterways.

Inside, high-efficiency heating/cooling systems will use refrigerants that do not damage the ozone layer or contribute to climate change. Motion sensors to shut off lights in empty rooms, dimming switches, and natural light will curb the demand for electric lighting. Low-flow plumbing fixtures will control water use.

For occupant health and comfort, paints and coatings used inside will be low in compounds that release irritating chemicals into the air, and the indoor air quality will be continuously monitored.

In purchasing materials and furnishings, the amount of recycled content is a criterion. Another criterion is how far they must be shipped—at least 20% of materials used will be produced locally or regionally. At least half the construction waste will be recycled.

Once the buildings are occupied, ORNL will operate them to obtain an Energy Star rating, which will require that they be maintained and controlled to take full advantage of the energy efficiency features.

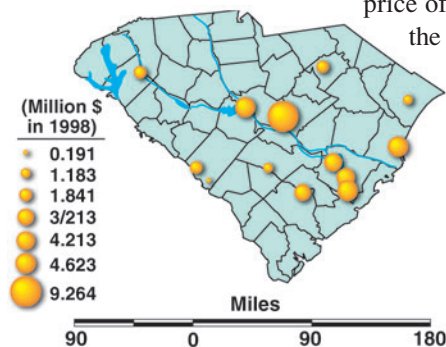
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A crane lifts a pre-assembled wall into place on one of ORNL's new buildings.

## ORNL Study Helps Assess the Whole Cost of Electricity Generation

Most power plants emit gases and particulates that affect air quality, the environment, and human health. These impacts are referred to as "externalities"—their costs (e.g., respiratory illnesses, and damage to ecosystems) are not reflected in the price of electricity. To estimate



Externalities of COAL power plants in South Carolina.

the impact of these hidden costs, an ORNL team analyzed power plant externalities for a year in the state of South Carolina. ORNL researchers estimated the external costs associated with airborne emissions (e.g., sulfur dioxide, nitrogen oxides) from fossil-fuel-burning power plants, as well as global-warming externalities associated with the emission of carbon dioxide (CO<sub>2</sub>). Their study also suggested ways state government could address these costs. The study was conducted in collaboration with the South Carolina State Energy Office.

Results indicate that for 1998, South Carolina had external costs of \$42 million from fossil-fuel power generation (see the table). The impacts depended on the amount of power generated

by a given plant, its emissions, and the size and distribution of the exposed population. The study calculated the annual external cost of CO<sub>2</sub> emissions to be \$105 million, based on a median value of \$3 per ton of CO<sub>2</sub>. Possible impacts of climate change on South Carolina

include higher temperatures and more frequent heat waves, with concomitant health effects; sea level rise, with related flooding, loss of wetlands, beach erosion, and saltwater contamination of water supplies; and changes in ecosystems.

The study found that external costs associated with natural gas power plants, generally thought to be low, were surprisingly high. Two factors might account for this: a relatively high population density around many of these plants and their inefficient use to handle peak, rather than base, load.

To address these concerns, state government could consider policies that: (1) affect the location of new natural gas plants, (2) promote renewable energy sources; and (3) internalize some external costs through emissions permit trading so that generators bear the costs of the permits that allow them to emit pollutants.

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Estimated annual externality and global warming costs in South Carolina (1998\$)

Power plant type	Global costs of pollutants (\$ × 1000)	Warming costs (\$ × 1000)
Coal	41,000	101,000
Natural gas	850	1,020
Oil	380	2,240
Biomass	250	[negligible]
<b>Total</b>	<b>42,000</b>	<b>105,000</b>