EASTERN LOW SULFUR COAL MARKETS AND ACID RAIN LEGISLATION

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As legislative action on acid rain approaches, electric utilities must weigh their options for meeting tighter sulfur dioxide (SO_2) emission requirements. For many, an attractive strategy will be to switch to lower sulfur coals from Central Appalachia -- the coal producing regions of southern West Virginia, Eastern Kentucky, Virginia, and Tennessee. Should utilities be skeptical about the future competitiveness of these coals?

Availability of Emission Reduction Options

Two strategies are viewed as the primary means of reducing emissions -- switching to "compliance" coal (with sulfur content less than 1.2 pounds (lbs.) SO_2 per million British thermal units (mm/Btu), or installing a flue gas scrubber. These have been the only two viable emission control options for most powerplant units built after the 1971 New Source Performance Standards (NSPS). However, most acid rain control bills now being considered do not specify a 1.2 lbs. SO_2/mmBtu standard similar to the NSPS, but would allow other emission reduction options to meet acid rain requirements at existing powerplants.

Most of the acid rain bills would allow utilities to trade emission reduction obligations among powerplant units. However, tighter unit-by-unit emission limits would not be specified across the board, leaving a wide range of alternative emission reduction strategies available for each unit, with all U.S. powerplants subject only to an overall tonnage reduction target.

For instance, under Phase II of HR 3030, the president's acid rain proposal (beginning 12/31/00), each pre-NSPS unit would remain subject to its current emission limits, but within that will also be allocated a specific amount of emissions -- allowances -- which it may keep or sell. Most existing units would be granted allowances equal to 1.2 lbs. SO_2/mmBtu times their 1985-1987 average annual fuel consumption.

Though no unit could ever exceed its current emissions limits, it could emit at relatively higher emission rates than will be required, if it buys allowances from another unit, or its fuel consumption is lower than 1985-1987 average levels, provided that some other units emit less than their specified allowances.

The flexibility enabled by emissions trading is illustrated by the simple example presented in Figure 1. A hypothetical utility owns three identical powerplant units (A, B, and C), with current annual average SO_2 emission rates of 5.0, 3.0, and 2.0 lbs. SO_2/mmBtu, respectively. Its annual SO_2 emissions total roughly 100,000 tons. Under Phase II of HR 3030, allowances would limit emissions from its three units to about 36,000 tons. Two possible emission reduction strategies are that unit A scrubs, unit B switches to compliance coal, and unit C continues to burn 2.0 lbs SO_2/mmBtu coal; or, all three units switch to compliance coal.

(For simplicity, this example neglects the possibility that powerplant use could increase from historical levels to meet future load growth, so that the use of com-

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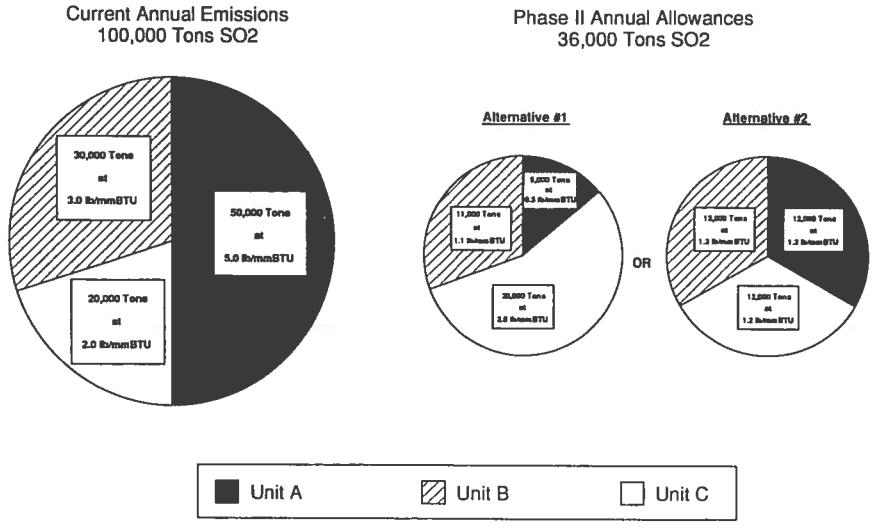
Figure 1
ILLUSTRATIVE ACID RAIN EMISSION REDUCTION STRATEGIES FOR A HYPOTHETICAL UTILITY



pliance coal at all units would not be sufficient to meet the tonnage limit established by a 1.2 lb rate and 1985-87 average fuel consumption.)

Clearly, many other strategies could also satisfy the 36,000 ton limit, including interutility allowance trades: The utility could make fewer emission reductions and purchase allowances from other utilities, or the utility could make further emission reductions and sell allowances to other utilities.

With the numerous emission reduction options that trading enables, familiar distinctions in coal sulfur quality become blurred. Coals that would otherwise barely fail compliance quality standards would be almost as valuable as compliance coal in their contribution towards the overall emission reduction obligation, thereby easing demands (and prices) for compliance coals.

The spectrum of emission reduction alternatives will therefore include a wide range of low sulfur coals, many pollution control technologies, (including developing, low-cost clean coal technologies, and other system-oriented options such as least-emissions dispatch), and emissions trading. Only after this full array of options is considered can the future picture for Eastern low sulfur coal markets become clear.

Costs and Availability of Eastern Sulfur Coals

After the institution of NSPS in 1971, low sulfur coal demand and prices increased dramatically during the decade, as many new coal powerplants subject to these regulations were built without employing then-developing scrubber technology, and adequate low sulfur coal mining capacity had not yet been developed.

Low sulfur coal producers adapted to these basic changes in market conditions, expanding low sulfur coal mining capacity considerably. And mining productivity increased at unprecedented rates during the 1980s, contributing significantly to the availability of lower priced supplies of compliance coals. Because of all this, real low sulfur coal prices have fallen during the past decade. Earlier predictions for continued high prices have failed to materialize.

For these reasons, future market conditions should also preclude sustained low sulfur coal price fly-ups under acid rain legislation. Competition among Central Appalachian producers is intense, and mining productivity continues to improve. Unlike the period after the promulgation of NSPS, low sulfur coal producers will not be caught by surprise by the passage of acid rain legislation. Most legislative proposals are phased to allow adequate time for an orderly expansion of capacity.

The considerable (but temporary) price fly-ups of the 1970s were largely limited to compliance coals for NSPS powerplants. However, under acid rain legislation with emissions trading, low sulfur "near-compliance" coals will have considerable value. As evidenced by Figure 2, "near-compliance" low sulfur coals from Central Appalachia in the 1.2-2.0 lbs. SO_2/mmBtu range are plentiful, and the existence of large quantities of "near-compliance" coals will ease demand and price pressure from Eastern compliance coals.

Central Appalachian compliance coal should be available for under $35 per ton -- in 1989 dollars -- at the mine through the early 2000s. Large quantities of low sulfur reserves remain in outcrops on mountainsides to be tapped by new small drift (or "punch") mines, which can be opened today at a cost of roughly $25-$27 per ton. Thus, it should not be necessary to mine coal from very thin or deep seams for years to come. Central Appalachian compliance coal supplies should be sufficient to absorb 50 to 75 million tons increase in annual demand without pushing prices above $35 per ton f.o.b.

Market Clearing Forces

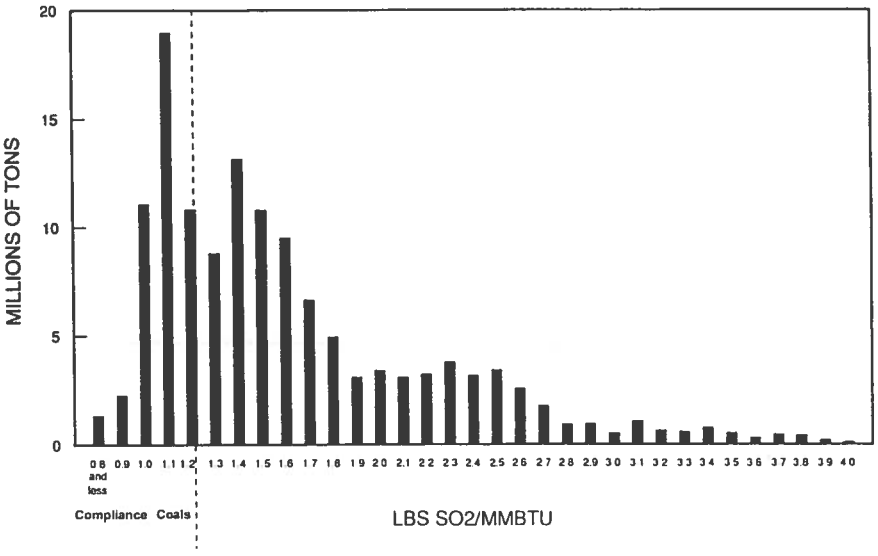
Coal markets in the United States are quite integrated, and competition exists both within and between coal producing regions throughout the country. Therefore, the "market clearing" prices for coal under new acid rain regulations will reflect the emission reduction choices made by electric utilities across the nation.

Because of intense competition from the wide range of emission reduction alternatives discussed previously, Central Appalachian coal price increases will be constrained in part by the costs of other emission reduction alternatives in Illinois and Indiana. Utilities in these states will be required to make major SO_2 emission reductions, and will have the choice between all three major classes of emission reduction alternatives -- low sulfur Eastern coals, low sulfur Western coals, and

Figure 2

1986 CENTRAL APPALACHIAN COAL SHIPMENTS TO UTILITIES

(By Sulfur Content)



continued high sulfur coal use with pollution controls.

Scrubbers will be the preferred alternative mainly at large high sulfur coal powerplants, where sufficient space remains for installing them and where low sulfur coal options are highly unattractive. Our acid rain analyses generally indicate that no more than 20-40 gigawatts of powerplants would find it economic to install scrubbers. (This assumes accepted scrubber cost estimates, and conservatively assumes that cyclone/west bottom boilers could not use any Eastern low sulfur coals due to the rarity of Eastern low sulfur coals with low ash fusion characteristics).

These "cost-effective" scrubbers will cost about $200 per kilowatt in 1989 dollars. This translates to roughly 6 to 7 mills per kilowatt hour cost increases at these plants on a 30-year levelized basis, which would support a $0.60 to $.70/mmBtu delivered price differential in the Midwest for compliance coal. Since high sulfur coal prices from the Illinois Basin would be expected to decline under acid rain legislation, and factoring in an additional $7-$10/ton transportation cost for Central Appalachian coal shipments to the Midwest, "net-back" minemouth prices for Central Appalachian compliance coals must remain well under $35 per ton to be competitive in the Midwest.

Western subbituminous low sulfur coals from the Powder River Basin (PRB) will also be a very appealing emission reduction option for many Midwestern utilities to consider. PRB coal has very low extraction costs and is available in extremely large quantities. At under $5 per ton F.O.B., PRB coal competes very favorably today on a delivered basis with Illinois Basin high sulfur coal in some areas east of the Mississippi River.

Common wisdom has held that bituminous coal powerplants would have great difficulty in converting to lower Btu PRB subbituminous coals. However, while pioneering conversion efforts did encounter difficulties, recent Midwestern conversions appear to have proceeded more smoothly, in some cases reducing costs outright. Our analyses show great potential for PRB coals to penetrate Midwestern utility bituminous powerplant markets. Therefore, competition from PRB coals will also limit minemouth prices for Central Appalachian compliance coal to less than $35 per ton.

Effects of Long-Term Emissions Cap

Concerns have been raised that many existing units could not be able to use low sulfur coals because of the acid rain bill's emissions cap, which requires emissions from new powerplants to be offset by further reductions from existing sources. It has been argued that this cap would essentially force many units to install scrubbers in order to create a safety margin of extra emission allowances for use when new capacity is eventually built.

However, the emissions growth required to be offset is likely to be much lower than is widely supposed. New source emission offset requirements by 2000 should be rather small; by 2010, they should be no more than 1 million tons, which is small relative to the roughly nine million tons of emissions from existing sources under acid rain legislation, and which can be absorbed mainly by further shifts to lower sulfur coals at existing units. Also, the installation of scrubbers before emission offsets are needed (during 2000-2005) is more costly than switching to lower sulfur coals, and more risky than waiting to scrub until emission offsets are actually needed later in the future. (Under a number of potential circumstances including lower than expected load growth, new low-emitting coal generation technologies, nuclear, or renewable capacity options, emission offset requirements could be significantly lower.)

Conclusions

Acid rain legislation need not lead to either widespread scrubbing or very high prices for Central Appalachian low sulfur coals.

If legislation allows it, emissions trading within and among utilities will prevent the absolute necessity for utilities to procure compliance coals. Abundant reserves of both compliance and near-compliance low sulfur Central Appalachian coals remain to be tapped for prices only moderately higher than current levels. Competition among these producers, as well as against Western coals and various pollution control technologies, will ensure that utilities have a wide variety of economic emission reduction alternatives from which to choose.

The net result is that minemouth prices for Central Appalachian compliance coals should remain below $35 per ton in 1989 dollars for at least the next 10 to 15 years. To the extent that other options can economically beat out Central Appalachian coals, increases in demand and prices for these coals would be moderated even further.

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