

Peak Coal

An NPG Footnote

By Lindsey Grant

The Energy Watch Group (EWG) in Germany has produced the most detailed and most disquieting study I have yet seen of the future of world coal production.¹ They start, as do most writers on the future of coal, from the national statistical data compiled by the World Energy Council (WEC), but they proceed from there to an exhaustive examination of those data and others. Their analysis leads to a much less sanguine view of the future of coal than most of us have uncritically accepted.

THE EWG ANALYSIS

The World. The Watch Group emphasizes that the data on proven coal reserves and inferred resources are internally and mutually inconsistent, but it believes it can draw some conclusions from the fact that they have almost always been revised downward when they have been re-examined. In the words of the report, “there is probably much less coal left to be burnt than most people think... the data quality of coal reserves and resources is poor, (but) the statistics overestimate (them)... both reserves and resources have been downgraded over the past two decades, in some cases drastically.”

Since 1987, India has raised its estimate of its proven recoverable hard coal reserves from 21 billion to 90 billion tons, and Australia much less sharply. All other revisions have been downwards. Some of them have been drastic. Germany, once a major player, has lowered its estimated hard coal reserves to near zero and its soft coal reserves (sub-bituminous and lignite) from 31 to 6.6 billion tons. Poland has halved its hard coal estimate and dropped its soft coal estimate to zero. The WEC estimates of total world hard coal reserves have declined 15 percent.² Some 85 percent of the reserves are in six countries: the U.S.A. (30 percent), Russia, India, China, Australia and South Africa, which also pro-

duce (in a different order) 80 percent of the world’s annual coal output.

Estimates of the world’s unproven resources are even more unreliable than for “proven recoverable reserves,” and the trend is worse. The WEC estimate of total world resources has declined 50 percent since 1980.

On that shaky statistical edifice, the EWG has undertaken to project the future. They conclude that “in the best case scenario, world coal production will peak around 2025 at 30 percent above present production.” (Emphasis added.)

That is a shocking prediction. The conventional assumption, based on WEC data, is that world coal reserves and resources total over five trillion tons. Depending on the quality of the coal, that is roughly 10 times the more optimistic estimates of the world’s remaining crude oil, in energy terms. It was assumed that it will last for centuries. Even that staunch proponent of Peak Oil, Kenneth S. Deffeyes, wrote that “Worldwide coal reserves are large enough to continue present rates of production for a few hundred years.”³ This in turn has led people to assume that coal will be available, albeit with huge environmental and climate penalties, when oil and gas are gone. Now the Watch Group tells us that coal production may increase in line with the International Energy Agency’s projection of demand through 2020, and then peak and swiftly fall behind. The timing is not much different from projections for oil and gas. It is a starkly different view of the future.

The story is worse for many countries. China is riding high, right now (except for the environment), but the EWG expects its coal production to peak and start to decline “within the next 5-15 years.” And, since China’s coal consumption is 37 percent of the world total, the

date when China passes its peak will probably set the peak for the world.

Let me add a cautionary note to that prediction. Given China's dependence on coal, its present pattern of industrialization, and the prospective tightening of world oil supplies, that would be a wrenching adjustment in a terribly short time. However, the EWG itself points out that this estimate is based upon highly dubious reserve figures that have not changed in 15 years. There are no published figures for China's unproven estimated coal resources, but the Chinese are building coal-fired power plants as if they believe they can count on more coal. In sum, the EWG peak figure for China may seriously understate China's total available recoverable coal.

The United States. We have more coal than any other country, but our position is not so favorable as the reserve estimates would suggest. Production has been rising, but the quality of the coal has been deteriorating as production has shifted from the dwindling high-energy coal in the Appalachians to lower grade deposits in Wyoming. In fact, the historical peak in energy terms, so far, was in 1998. Spot prices in the Powder River Basin have averaged about one-fifth of those in the Central Appalachians, reflecting that energy differential and the remoteness from major markets.

The Watch Group ran several projections of future U.S. production. Using U.S. official figures for estimated recoverable reserves (again not considering unproven potential resources), U.S. production by weight would peak about 2070 at 60 percent above present levels, but the quality would decline, and that increase would represent only a 45-50 percent increase in energy content.

Going beyond that, the Group observed that 60 percent of those reserves are located in Montana, Wyoming and Illinois. Production in Illinois, Ohio and Kentucky has been declining in recent decades; in Montana it has been flat at a very low level, despite the huge reported potential. The Group attributes that behavior to a combination of possible causes: poor coal quality, high sodium and sulfur content, the threat to water resources, the contamination of soils and water, resistances to mining because of the environmental damage, and perhaps an overstatement of the actual reserves. The Group questions whether all the alleged reserves will

ever be mined. On balance, it concludes that, "it is very likely that bituminous coal production in the U.S. has already peaked, and that total (volumetric) coal production will peak between 2020 and 2030. The possible growth to arrive at a peak measured in energy terms will be lower, only about 20 percent above today's level."

That, again, is a very different scenario from the conventional wisdom.

CRITIQUE

There is a parallel here with oil. For decades, the conventional wisdom was that it would last forever. Only as the evidence mounted that it was running down in one oil field after another have the conventional oil "experts" grudgingly admitted that shortages loom ahead.⁴ Even then, most of them write of a "period" of tightness, rather than facing the logical prospect of a peak and a long decline. There seems to be something in the human psyche that hates to admit that the bonanza can end.

However, reliance upon proven reserves (and questionable figures at that) introduces a systematic pessimistic bias in the EWG calculations.

The Watch Group apparently was formed to question the conventional wisdom and thereby to persuade the world to move ahead more swiftly with renewables. Since the coal report, it has done one on crude oil which is similar to the lowest of earlier projections.⁵ They may well feel an obligation to play Devil's Advocate. One can legitimately ask whether they are being too pessimistic. Why the question?

1. The Group's projections take little account of estimated but unproven resources. It does say that, "The estimated resource base should be regarded as a final limit for the amount which ultimately can be recovered." As a practical matter, however, its projections are made by fitting Hubbert bell curves to the records of historical production, country by country, using the WEC reserve estimates to locate a peak in countries that have not reached it. They are grounded on past experience rather than hopes for future confirmation of resource estimates. That may be too cautious. Current estimates of unproven world coal resources are highly problematical, but they are about nine times the estimated reserves. One would

assume that some of that coal will be confirmed and mined.

2. For the United States, in particular, the question arises: Does past production perhaps reflect demand rather than potential supply? We have had access to oil and gas, which are more attractive fuels. If we get desperate for fossil fuels, will we not exploit those extensive deposits, damaging as it will be?

To rebut those two arguments, one might point to the sharp decline in estimated coal resources. There may be more declines to come. Moreover, there is a time lag between the confirmation of resources and their subsequent exploitation. Those resources, if they are eventually mined, may do more to extend the coal era than to raise peak production. Indeed, the general wisdom is that no major new discoveries are on the horizon.

The questions I raise about the projections underline their pitfalls, but they do not undermine the EWG's fundamental point that coal is likely to play a much less important role in future energy than has generally been assumed. The Group makes a good case that the WEC figures for total reserves and resources are based on very flimsy data and probably overstated. Moreover, we don't have the luxury of counting on production at "present rates." The coal is being consumed at an increasing rate because of population growth, because of the dramatically rising demands by industrializing nations, and because coal will be called upon to replace oil and gas as they decline. And that hastens the day of Peak Coal.

The future is coming faster than we thought.

THE CONSEQUENCES

For new readers, let me describe some of the consequences.⁶ Most of the infrastructure of modern life simply will stop working with the decline and end of fossil fuels, starting with the airlines but continuing through other transportation systems, housing and living patterns – skyscrapers and exurbs – and indeed our fundamental living patterns. The prospect for coal sketched by the EWG accelerates that change. One can envisage rising tensions and the collapse of societies into internal and international hostilities. China, Europe, Japan and Korea are perhaps most immediately threatened, but – with sta-

ble or declining populations – at least they have begun to get a handle on rising demand. The United States has not.

For the U.S., the cushion of coal resources has gotten smaller and less comfortable. We already depend on imports for most of our crude oil, even as world supplies begin to dwindle. We have consumed half our natural gas reserves and resources, even by the optimistic USGS calculations, and have not again reached the peak production of 1973.⁷ With domestic gas production in decline, gas imports by ship are costly and must compete with other nations better positioned to import them by pipeline. The EWG figures suggest that coal will soon follow oil and gas.

With all three declining, U.S. food production will be in peril because of shortages of hydrocarbon-based commercial fertilizer, pesticides and fuel to grow food and ship it to market. (This is a point that most observers miss, even when they recognize that population growth increases the demand for food.) Coal can be substituted for oil and gas, but not if it, too, is in decline. Right now, we are in a better position than most countries to shift back to sustainable organic agriculture because the United States is among the best-endowed nations, per capita, in arable land, water, soil, and sunlight. With global warming, we may soon have too much sunlight, and our advantage in arable land and water is dissipating. Our population is already much too large to live on organic agriculture, and population growth makes it worse every year, as we continue our permissive view of mass immigration and our non-policy about natural population increase.

The need to bring world and U.S. populations down to fit a diminished energy supply is more urgent than ever, but if the EWG projections are anywhere near right, we do not now have enough time. We cannot bring demand down fast enough to achieve a smooth shift to renewable energy. We will get there, perforce, but the transition will be more abrupt, more painful and probably more turmoil-ridden than I had thought before reading the EWG paper. The view gets grimmer as we get closer to the future.

There is one consolation: the less coal burned, the less it will force global warming.

NOTES

1. Dr. Werner Zittel and Jorg Schindler, "Coal: Resources and Future Production", Ludwig Bolkow Systemtechnik GmbH, Ottobrun, Germany, Final Version 7-10-07. The text can be found at www.energywatchgroup.org under Publications/Reports. I am indebted to Dr. Walter Youngquist, petroleum geologist and author of *Geodesinies*, for bringing this study to my attention.
2. "Hard coal" includes what is left of anthracite deposits, plus bituminous coal; the energy range is from 18.8 to 30 MJ/kg. "Soft coal" includes sub-bituminous coal with an energy range of 8.3-25 MJ/kg and lignite, at 5.5-14.3 MJ/kg. Lignite is marginal. The reserves are limited, it is not usually transported any distance because its energy content does not justify the effort, and it is usually used locally for heating.
3. *Beyond Oil: the View from Hubbert's Peak* (Hill & Wang, New York, 2005.) p.82.
4. Lindsey Grant, "Peak Oil: Are We There Yet?" (NPG Footnote, November 2007.)
5. Zittel & Schindler, "Crude Oil: The Supply Outlook", EWG 3/2007, 10-7-07. See Note 1.
6. For more detail, see *The Collapsing Bubble: Growth and Fossil Energy* (Santa Ana, CA. Seven Locks Press, 2005; available from bookstores and www.amazon.com). Plus *Valedictory: The Age of Overshoot* (Alexandria, VA. Negative Population Growth, Inc., 2007.) A similar summary appears in "Peak Oil. Are We There Yet?" (Note 4.)
7. (A)U.S. Geological Survey, "Executive Summary, USGS World Energy Assessment 2000" Digital Data Series 60, Table 1. 50% confidence figures are reproduced in *The Collapsing Bubble* (op cit), p.25. (B)U.S. Energy Information Administration, Natural Gas Navigator, U.S. Dry Natural Gas Production, updated 10-3-07.

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