

How the Evolving Market for Electrical Power Benefits the Wyoming Economy

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The market for electrical power provision experienced significant changes in 1990's. This pace of change is ongoing and is expected to continue over the coming years. Given Wyoming's relatively large supplies of natural resources, particularly energy resources used in electrical generation, it is interesting to consider the way in which changes in the market for electrical power will affect the state.

I'd like to begin with a brief illustration of the importance of mining in the Wyoming economy. (For the purpose of this talk, the term 'mining' is meant to include oil and gas extraction.) In particular, we'll observe that the state's economic performance through the current slowdown largely reflects the superior performance of the mining industry. I'll then turn to an examination of changes underway in the market for electricity, factors that came into play over the past decade and those that are in force now. For a number of reasons that I'll make clear in the talk, the Wyoming economy has been a prime beneficiary of these changes and stands to enjoy additional gains over the coming years. For worse or, as is currently the case, for better, Wyoming's broader economic fortunes are closely linked to those in the energy industry.

Wyoming ranks first among states in coal reserves, holding approximately 37 percent of domestic reserves. In addition, the state ranks third, behind Texas and New Mexico, in the volume of dry natural gas reserves. And, the gas reserves that the state does have are a relatively untapped resource. From 1999 to 2000, Wyoming led the nation in additions to proved dry gas reserves. These additions were partly a result of the development of coalbed methane fields in the Powder River Basin and elsewhere.

A large endowment of natural resources translates into a large supply of jobs in resource extraction. Compared to national averages, Wyoming has a relatively high concentration of jobs in mining, energy extraction, and support services. According to several Federal data sources, a majority of Wyoming's mining jobs, mining establishments, and the value of their shipments come from energy extraction.

These industries have performed well through the contraction and Wyoming has benefited. The chart compares the level of employment in Wyoming to that of the nation. The period we're looking at starts at the beginning of the recession and goes through June of this year. The blue line at the bottom illustrates the employment contraction experienced in the U.S. in general. In contrast, Wyoming has experienced continued job growth throughout this period, and remains above pre-recession levels. This expansion in state employment was led by an expansion in employment in mining and energy extraction, shown as the red line.

So basically, Wyoming avoided recession in no small measure due to the performance of the mining sector. I thought it would be interesting to take a look at the primary factors driving this sector. What is particularly interesting at this point in history is that a number of innovations, mostly in the market for electrical power, are having a profound impact on energy markets in general. Given the particular composition of Wyoming's energy resource endowment, the state's economic fortunes are closely tied to developments in this one industry.

The evolving market for electrical power is being shaped by three basic forces: market restructuring, environmental regulation, and technological innovation. The map presented here illustrates the status of state electricity restructuring activity. The purple colored states are active in the restructuring process. In these states, competitive retail access is either currently available or will soon be available to at least some customers. A dark green colored state signifies a delay in restructuring or implementation of retail access. California is the only state in which reforms to bring direct retail access have been suspended. Yellow colored states are not actively pursuing restructuring.

In the wake of the California electricity crisis, market liberalization is largely proceeding where it was doing so before. Seventeen states plus the District of Columbia have completed at least partial transition to a competitive market. And deregulation is continuing, albeit at slower pace, in six of the seven states in which it had also been initiated. Moreover, continued Federal efforts to rationalize the national grid should slowly relieve regional transmission constraints. This development is expected to create incentives for market reforms to take hold in other states. Efficiencies enjoyed through continuing market reforms are expected to sustain modest demand growth for electricity, and the fuels supplied by Wyoming for electrical generation.

Environmental regulation is a second factor having a significant impact on the electricity industry. Regulation of electrical generators largely began with the CAA of 1963. This was the first to set emissions standards for stationary source polluters, such as electrical generators.

The first major amendments came with the CAA of 1970. This set much more stringent emissions standards than the 1963 law. In addition, the 1970 law encouraged use of low sulfur fuels in an effort to reduce SO₂ emissions, a principal component of acid rain. The law also required use of BACT to minimize other emissions. In English, BACT simply means use of the latest generation of scrubbers. Finally, the law authorized an emissions trading system for SO₂ allowances.

The CAA 1990 further tightened SO₂ emissions restrictions. What's interesting about this law is that it allows generating units to achieve reductions through a number of compliance methods. The least expensive method of compliance, as it turns out, is to convert a coal fired plant to low-sulfur coal. For each ton of SO₂ emissions avoided, conversion to low-sulfur coal is less than half the cost of scrubbers, the next least costly method. As a result, this has been the most popular method of compliance. Converting to low-sulfur coal was the method used by a majority of plants required to comply with the first phase of the 1990 act. These plant conversions are helping to shift demand for coal to Wyoming from other coal mining areas.

Technological innovation is the third factor reshaping markets for electrical power and related inputs. Technological improvements have significantly improved the economics of gas-fired electrical generation. These innovations have basically improved the thermal efficiency of a number of different types of gas turbines. The end result is that maximum thermal efficiency can be achieved at a much lower scale – anywhere from a half to one one-hundredth the size of conventional electrical generating units. This means that investments in gas fired electrical generation are relatively less capital intensive, translating into less risk and earlier payouts for investors. As a result, an increasing fraction of natural gas is being used for electrical generation. Rapid growth in the use of gas for electrical generation began in the mid 1990's. Since then, growth in gas-fired generation has played a major role in supporting gas prices at levels that justify development of Wyoming's resource base.

Though an increasing amount of gas is being used to generate electricity, a majority of electricity continues to be generated from coal fired plants. So we also need to consider if technological innovations in the mining industry have been important for understanding changes in the market for electrical power. And they have.

Productivity at coal mines improved by about 4 percent per year from the 50's through the 1990's. And productivity improved at a better than 6 percent pace over the past two decades. A number of innovations have played an important role in increasing mine worker productivity. In surface mining, for example, the capacity, size, and performance of draglines and power shovels have increased. These improvements have contributed significantly to growth in production from large scale surface mines. In addition, mine planning and equipment maintenance have been improved through application of information and communication technologies. These allow improved scheduling and monitoring of equipment.

Technological changes notwithstanding, mining productivity is simply higher in surface mining, which lends itself to larger scales of operation. As a result, the location of coal mining has continued to shift from the relatively costly underground mining operations common in the east to the relatively more productive, surface operations that predominate in the west. In fact, the graph shows that in the late 1990's, production from western states surpassed that from eastern states. Continued technological improvement in mining and a continued shift to western production, where relatively low-cost surface mining techniques can be applied, are expected to enable a sustained improvement in mine worker productivity

Natural gas

Advances in gas-fired generation along with environmental regulations are encouraging investment in gas-fired capacity. Several fundamentals have converged to provide much of the support for natural gas demand in the coming years. As a result, prices for natural gas are forecast to remain higher than historical averages. This is particularly important for Wyoming producers because one of the reasons that the state's gas resources are relatively undeveloped is that historically low prices did not justify the high fixed cost of installation of gas transmission capacity.

In fact, limited natural gas transmission capacity is perhaps the most important challenge currently facing the gas producing sector in the state. Limited transmission capacity has led to a large differential between Rocky Mountain prices and those elsewhere in the nation – so much so that Wyoming producers are currently receiving approximately \$1.50 to \$2 below the Henry Hub benchmark. One estimate places lost tax revenues to the state on the order of one million dollars per day.

Perhaps the most important question facing investors and policymakers is whether the current transmission premium reflects a true shortage of physical capacity or is a result of too little existing capacity being offered to the market. If the premium reflects a true shortage of physical capacity, then investors will interpret the price signal accordingly, and bring new capacity to market. If the premium reflects a withholding of existing capacity, investors need not respond in the same manner.

Coal

Though natural gas will serve much of the nations growth in electricity demand, coal will continue to serve the majority of the nations electrical generation needs in the coming years. However, the constant factor driving coal prices over this period is productivity improvements, which will extend the slow slide in coal prices into the future.

Nonetheless, the outlook for Wyoming's coal industry is relatively positive. The production of surface mined coal is simply more cost efficient than underground coal. As a result, western states are expected to continue to add to their national share of coal mining at the expense of eastern production. In addition, ongoing environmental concerns will continue to shift demand to the relatively low sulfur coal prevalent in Wyoming. In spite of declining coal prices, Wyoming stands to gain as the geographic composition of production will continue to shift in the state's favor.

I'd like to briefly summarize these conclusions. The evolving market for electrical power has implications for natural gas and coal markets so critical to the Wyoming economy. The restructuring of markets for electrical power is expected to continue, though perhaps at a slower pace than originally planned. Efficiencies enjoyed from opening generation to competition are expected to lower consumer prices and help to sustain modest demand growth for electricity.

More importantly for Wyoming, perhaps, environmental regulation and technological innovation are increasing demand for the very resources the state happens to hold. Overall, Wyoming stands to gain as increased demand for gas in general, makes profitable development of the state's relatively untapped reserve base. And shifting demand toward low-sulfur coal make the states coal reserves preferable to alternative supplies.