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8 Airport Road
Bethel, ME 04217, USA

Trump Wants to Save the Coal Industry. We Offer a Plan that can Help.

By William Strauss, PhD – January 2, 2017

The plan that this white paper discusses will sustain coal mining jobs and will create tens of thousands of new jobs in another sector that is experiencing significant job losses: the forest products sector. The plan will also stimulate billions of dollars of new investment in new US manufacturing plants.

The plan is based on a strategy that FutureMetrics has discussed in previous white papers: the use of US produced wood pellet fuel blended with coal in large utility power stations. By supporting the blending of industrial wood pellet fuel with coal in pulverized coal (PC) power plants, **policy will lock-in the need for PC power plants and therefore will guarantee significant demand for coal.** This well-proven strategy, which is already in place in many other countries, can provide certainty for the need for US produced coal for decades and certainty for US coal mining jobs.

The strategy this paper proposes as a policy for helping the US coal producers is based on proven low cost modifications of coal fired power stations to allow them to blend industrial wood pellets with coal. For example, at a 10% ratio of pellets to coal, the policy locks in the need for coal to be 90% of the fuel mix and, as a by-product, lowers carbon emissions enough to allow the US to show progress in carbon emissions reduction.

The global industrial wood pellet market is a large and growing market. North America is exporting almost one shipload per day (about 8 million metric tonnes in 2016¹) to power plants in England, western Europe, Japan, and South Korea.

As this paper shows, the strategy that the Trump administration could follow is a win-win-win for the coal sector, the forest products sector, and for the environment.

This strategy has many advantages:

| | | |
|---|---|---|
| · Uses existing power stations | · Much lower capital cost than new natural gas plants | · Reliable / same uptime / no de-rating |
| · Flexible / baseload or on-demand generation | · Demonstrated at scale in many locations | · Utility not overly dependent on natural gas |
| · Lower carbon emissions | · Sustains and creates jobs | · Lower SOx, NOx, Hg emissions |

¹ Data from Argus Direct through October, 2016. Data taken on December 22, 2016 with estimate for final two months of 2016 by FutureMetrics.

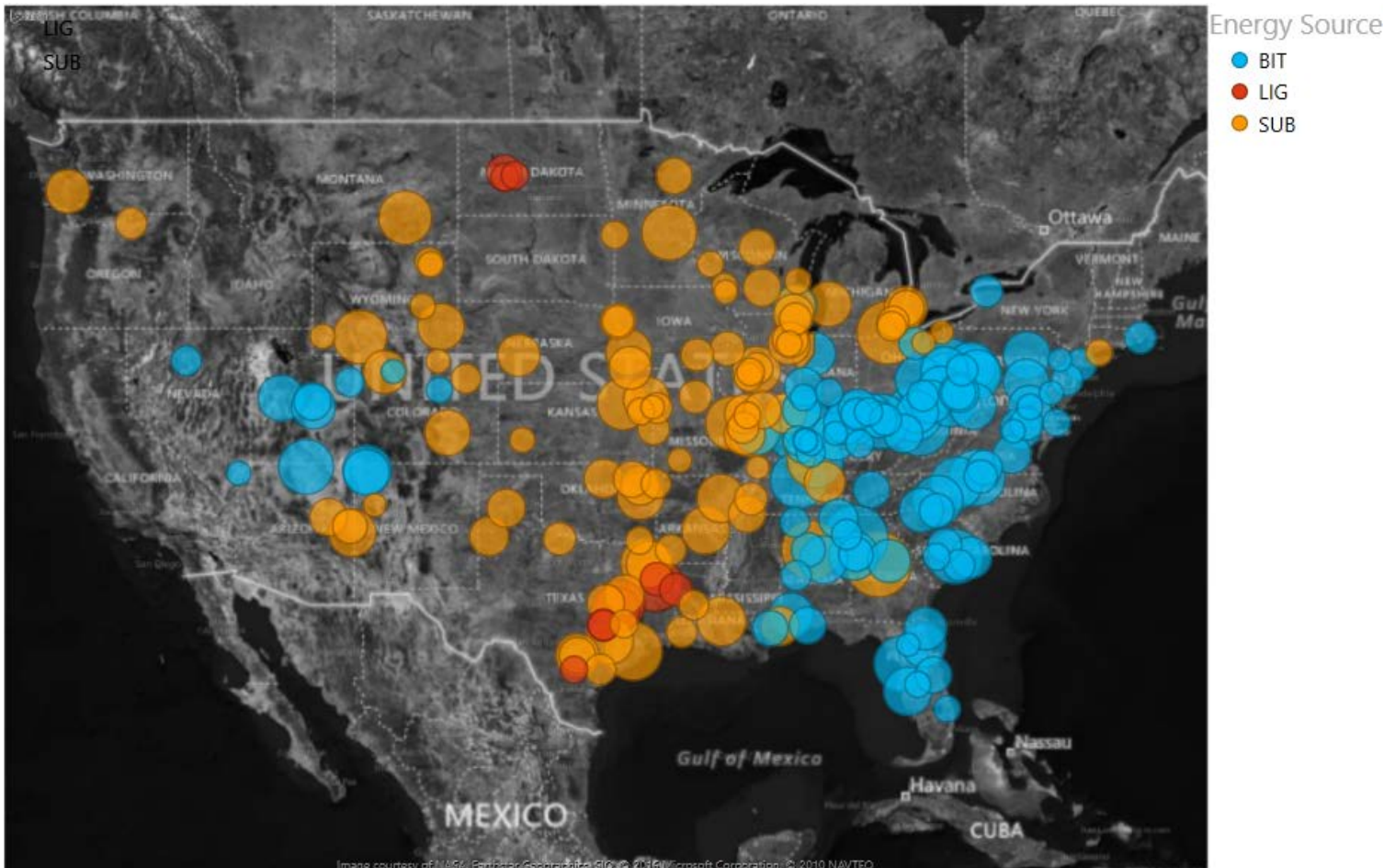


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The existing fleet of power plants and the shale gas revolution

The map below shows the locations and type of coal used at the 435 still operating coal fueled power plants larger than 250 megawatts (MW's)². The chart on the next page shows that most of the larger power plants use pulverized coal (PC) technology. PC power plants are easily modified to use a blend of coal and industrial wood pellet fuel. As noted in the table at the bottom of the proceeding page, the modified plants are just as reliable and output the same amount of power as they did when running on 100% coal.

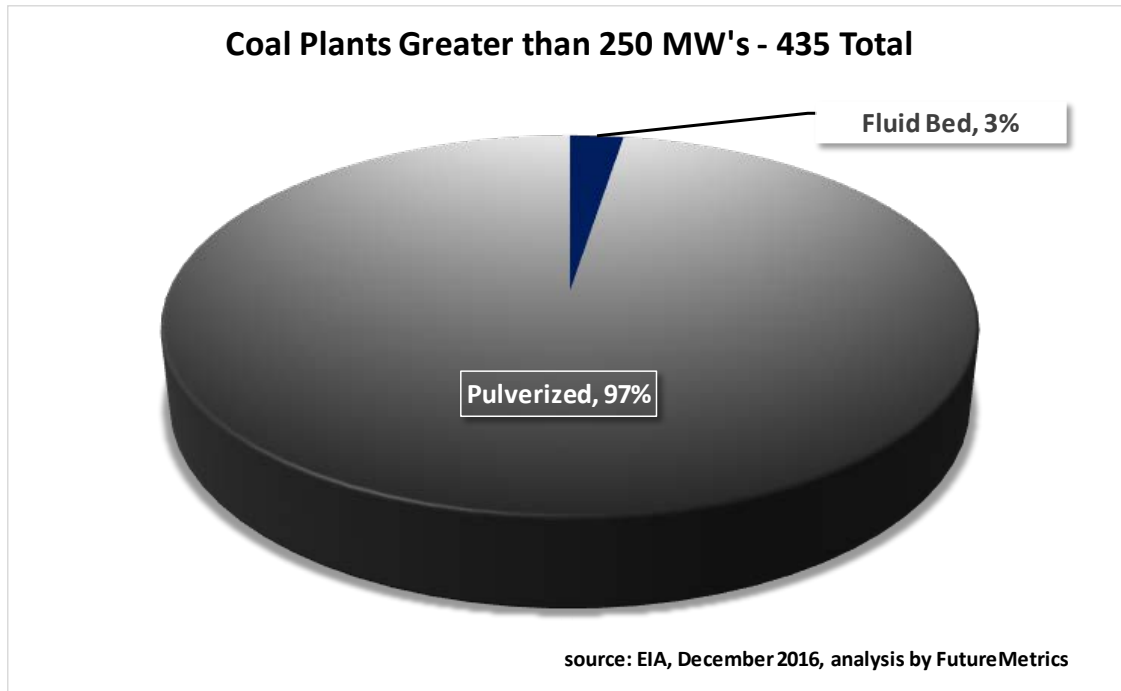


² Data from the EIA Form 860, December, 2016. BIT= bituminous coal, SUB = sub-bituminous coal, LIG = lignite coal.



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Coal fueled power stations still provide over 50% of the available large scale utility electricity generation in the US (excludes stations smaller than 250 MW's).

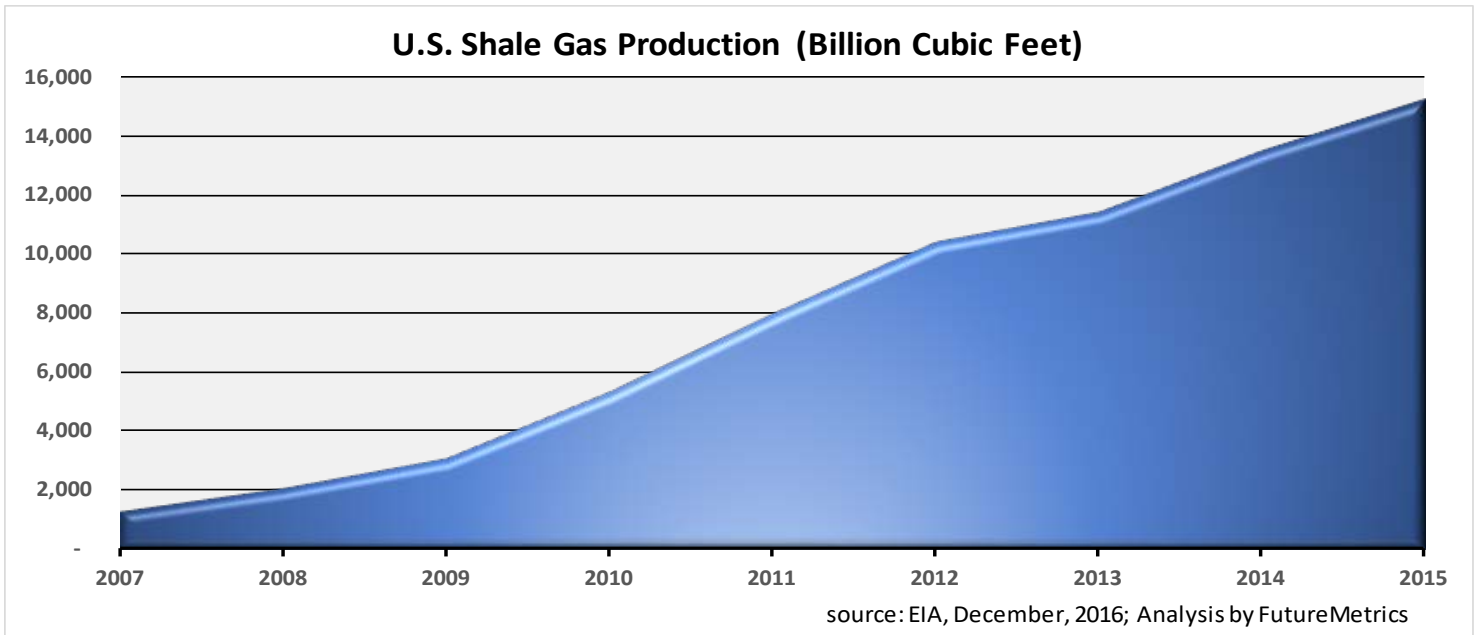
| Percent of Nameplate for all Generators >250 MW's | |
|---|-------|
| Natural Gas | 22.1% |
| Coal | 50.3% |

But that is changing rapidly; not because of environmental rules but because of low cost natural gas (NG). Hydraulic fracturing (fracking) in shale formations has opened up massive reserves and a flood of NG resulting in very low prices. As the chart on the next page shows, shale gas production has increased more than eight fold in the past 8 years.

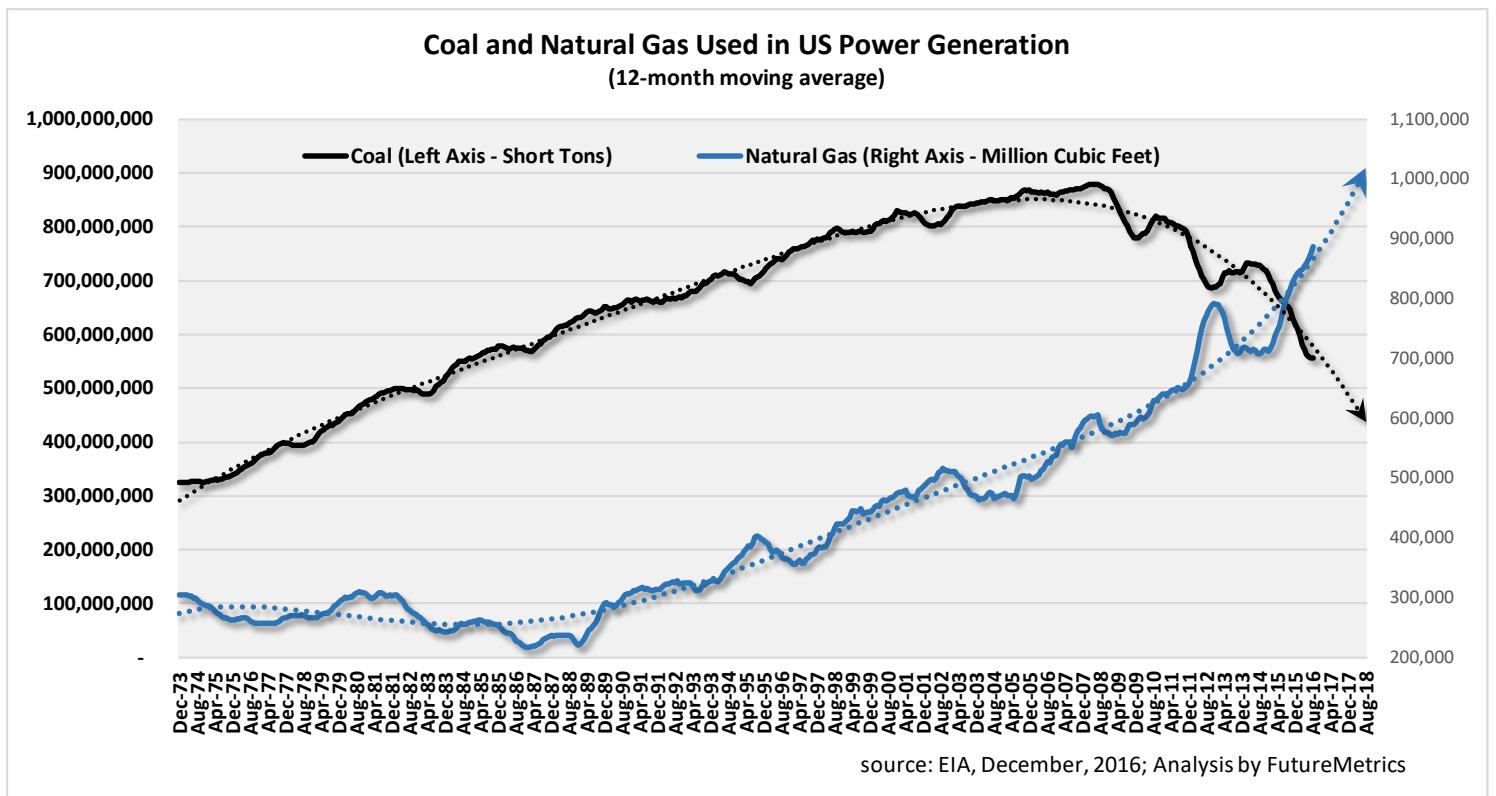


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As a result of current and expected future low cost NG, the power sector has been shifting from coal to NG by building new NG fueled power plants and retiring older coal fueled power plants.

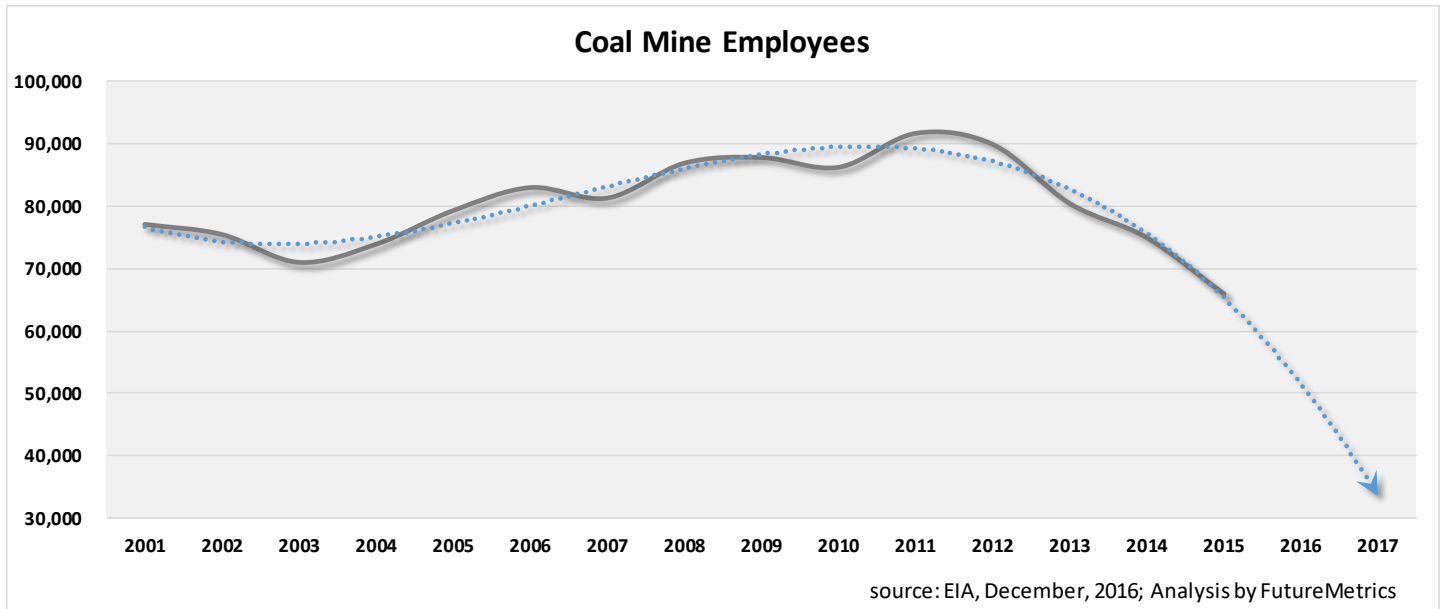


The shift from coal to NG has created very challenging conditions in the coal mining sector. If current trends continue, employment in the sector is likely to continue to decline significantly.



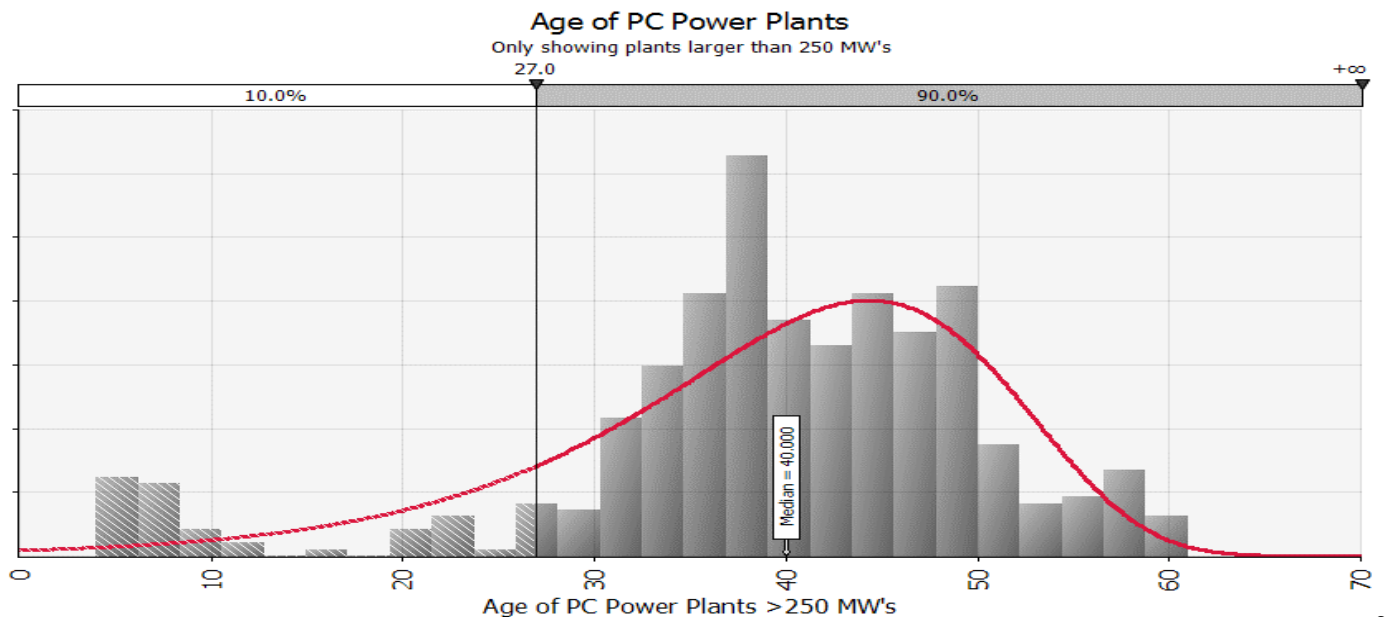
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There is no reason to think that current trends will not continue.

Furthermore, the US coal fired power plant fleet is aging. The median age of PC power plants larger than 250 MW's is 40 years. As the chart below shows, 90% of larger PC plants are 27 years old or older.



As the coal generation fleet ages, given low cost natural gas, there is little incentive to build new coal plants.

The phasing out of coal is not a result of environmental strictures. It is a function of low cost NG and an aging fleet.



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Policy that can change the trend

Absent policy that influences the markets, the utilities will continue to shift into the low cost NG that can be used in easy-to-build, and easy-to-run and maintain combined cycle NG power plants.

However, the new Trump administration does not seem shy about potentially implementing policies that will influence the markets.

The question is: what is the underlying goal of a policy?

With respect to the power generation sector, in the Obama administration the goal of policy has been to lower carbon emissions. The Clean Power Plan was created for that purpose. It is highly unlikely that the CPP will survive the Trump presidency.

In the Trump administration, a stated goal is to bring jobs back to the industrial heartland with specific attention paid to the coal mining sector. To achieve that goal, the administration will have to implement policy that changes the economics of power generation. There will have to be a reason that utilities will choose to keep the coal plants running.

What we are offering in this paper is a strategy that will save coal mining jobs and result in more jobs than firing on coal alone. The strategy also yields a much higher job sustaining/creation impact than shifting from coal to natural gas.

The chart on the next page shows the total jobs that are a result of provisioning a 400 megawatt power station with fuel. The total jobs include the multiplier effects (the indirect and induced jobs that are a result of the direct jobs).

The mining, refining, and transportation via rail and truck of coal is more labor intensive than the extraction and pipelining of NG.

The jobs created to deliver the equivalent energy to a PC power station in the form of industrial wood pellets are even greater than the jobs created from supplying coal.

And there are zero jobs associated with fueling wind or solar power plants³.

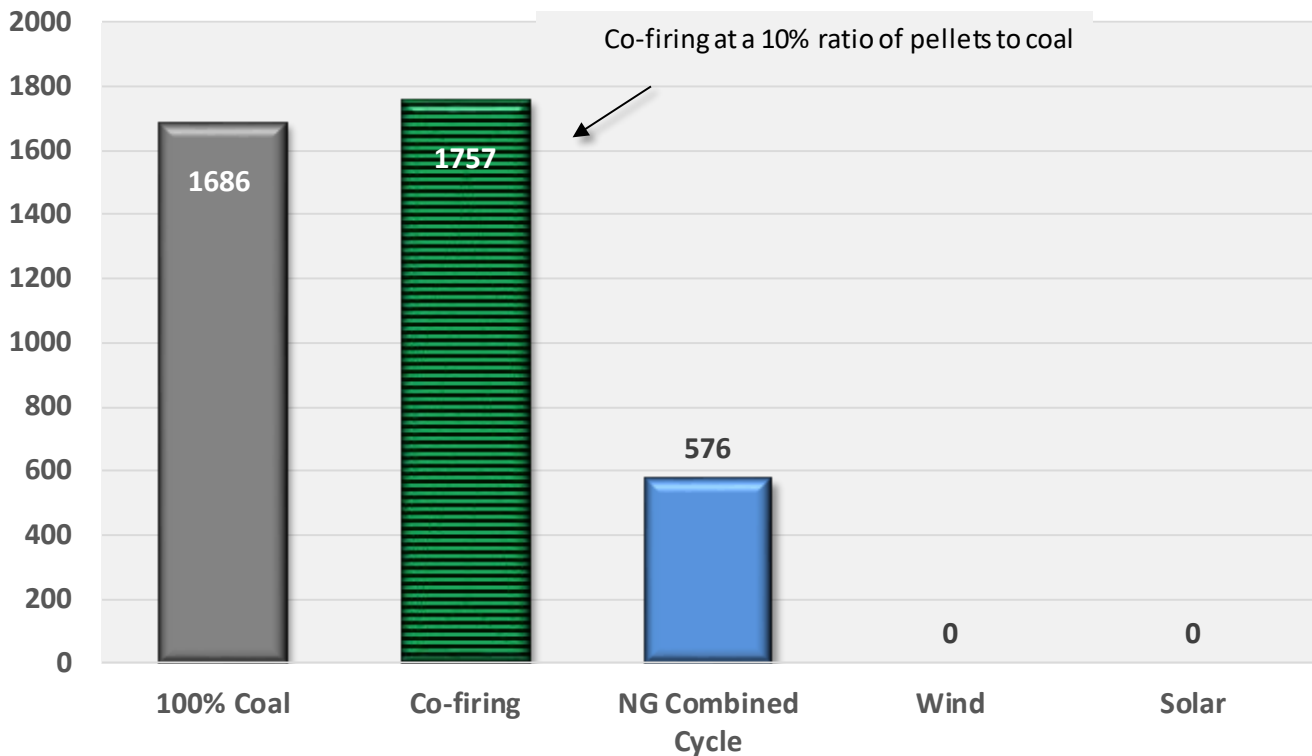
³ While wind and solar have a role in the power generation mix, they both do not provide on-demand (peaking) or baseload power. When the wind is not blowing and/or the sun is not shining, either hydroelectric or thermally generated (coal, NG, or nuclear) have to make up the shortage to keep the electric grid energized.



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Total jobs as a result of providing fuel to a 400 MW power station



Analysis on pellet jobs by FutureMetrics. Data on coal employment from "U.S. Coal Exports: National and State Economic Contributions", Ernst & Young, May, 2013. NG jobs based on percentage of NG that goes to the power sector and data on job from the American Natural Gas Alliance. All include direct, indirect, and induced jobs calculated with IMPLAN. Analysis by FutureMetrics

If sustaining and creating jobs is the objective, then a policy that keeps some of the coal generation fleet running will help to realize that objective.

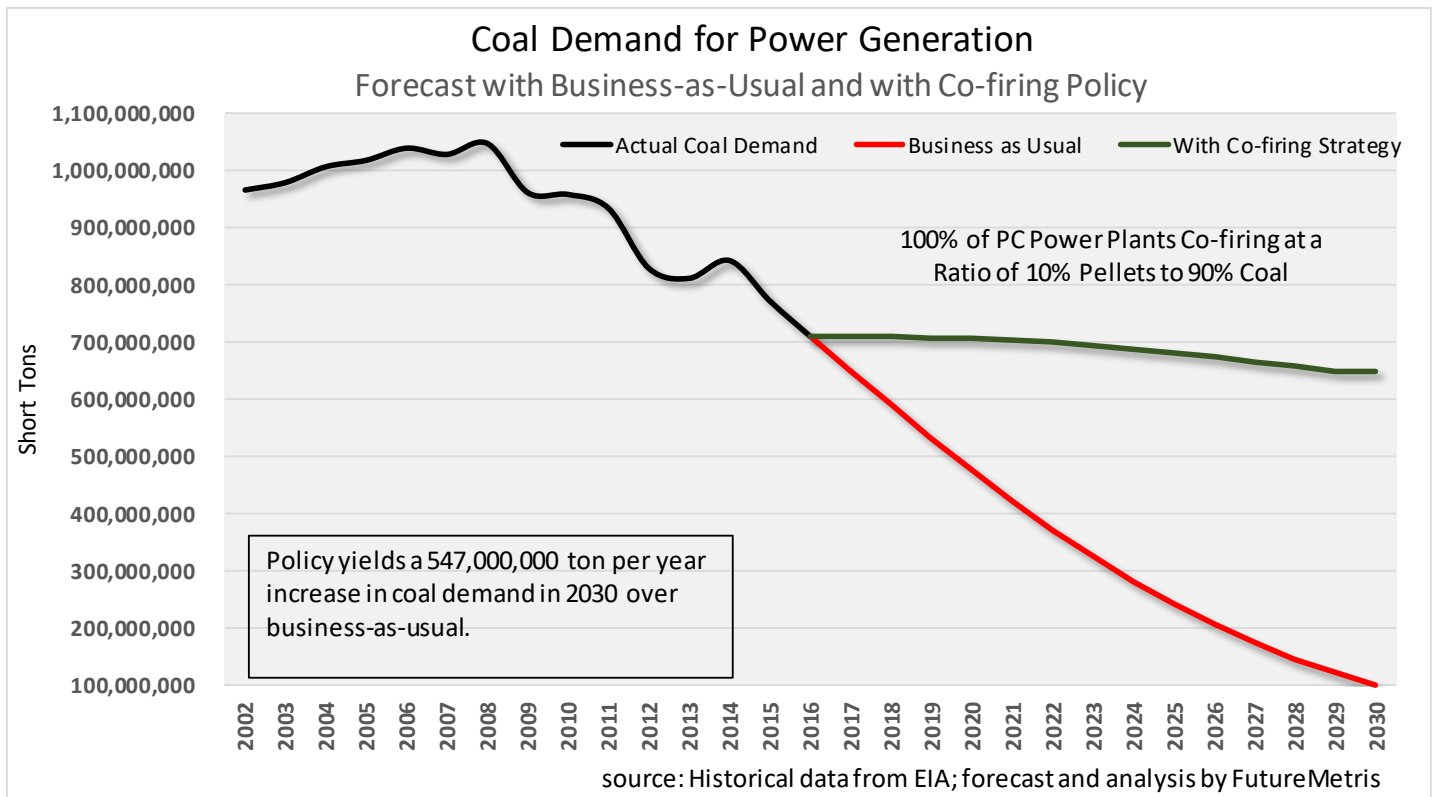
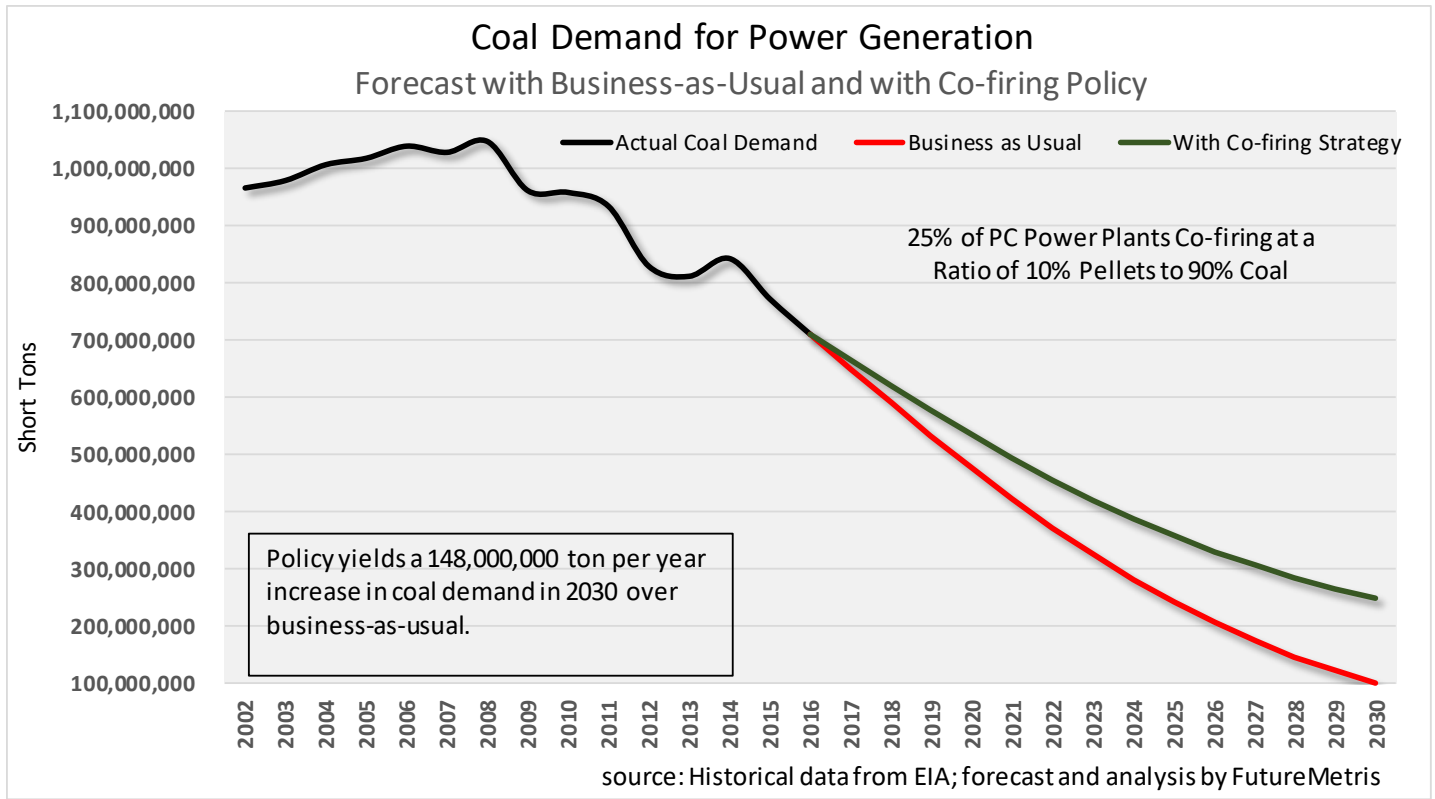
The chart on the next page shows how a policy that supports a co-firing strategy will guarantee a significantly higher demand for coal (and therefore for coal mining jobs) than business-as-usual. The cohort of PC power stations that do not co-fire (business-as-usual) continue to see their markets taken over by NG generation. But the cohort of PC power stations that do co-fire remain running and, in the example used in the chart on the next page, continue to demand coal at a rate that is 90% of what it would be if the plant ran only on coal.

If PC power plants representing 25% of total coal demand co-fire a blend of 10% pellets and 90% coal, coal demand in 2030 is estimated to be 148 million tons per year higher than if there are no policy incentives for keeping the coal plants running. A higher proportion would result in an even higher demand for coal in 2030 versus business-as-usual. The second chart on the next page shows a scenario in which 100% of the PC power plants co-fire. That scenario is not realistic for several reasons but is shown to illustrate the impact that a co-firing policy can have on the coal demand.



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Of course the policy could simply focus on a scheme for keeping coal power plants running on 100% coal. **But there are two important reasons that the Trump administration should consider a co-firing scheme.**

(1) More Jobs and Significant Manufacturing Investment: Most of the PC coal plants and many of the coal mines are in states that also have significant forest products industries. The steady decline in the pulp and paper sector is closing pulp mills across the US and with each closure thousands of mill jobs and logging and transportation jobs are lost. Industrial pellet fuel can be made from the same feedstock that goes into pulp and paper mills.

Every 500,000 ton per year pellet manufacturing plant sustains about 800 direct, indirect, and induced jobs across the forest projects supply chain. A policy that supports co-firing supports jobs in two large and economically important sectors: coal and forest products. In the example in the first chart on the previous page, the US would need to produce about 20 million tons per year of industrial wood pellets to provide the 10% blend in those power stations. This would be a significant long-term demand that would generate billions of dollars of investment in new production capacity⁴. Each 500,000 ton per year pellet fuel manufacturing plant costs, on average, about \$125,000,000 to build.

The actual percentage of the PC power fleet that co-fire will be based on an analysis of the age of the power stations and the proximity to potential pellet fuel supply. Utilities would like to avoid stranding newer coal fueled generating assets and this strategy provides a pathway to keeping the newer plants operating over their useful life while sustaining and creating needed jobs in two important sectors.

(2) Lower CO₂ Emissions: Co-firing industrial wood pellet fuel with coal lowers carbon emissions versus 100% coal. While it would appear that the Trump administration will not make carbon emissions mitigation the foundation of any policy, in the case of a co-firing strategy, CO₂ emissions reduction is a by-product of a job protection, job creating, and manufacturing growth policy. Thus the administration can take credit for advancing the US's role in lowering greenhouse gas emissions as a corollary to the actual policy objective.

Is this idea really costly?

The short answer is no. FutureMetrics has published several papers (freely downloadable from the FutureMetrics website) reviewing the costs of co-firing.

⁴ The industrial wood pellet sector's limits to production rates per year are bounded by the ability of the working forests to produce new growth equal to or greater than the annual harvests. For reasons both of sustainability of supply, and to achieve zero carbon emissions in combustion, the industrial wood pellet sector's annual demand for feedstock cannot exceed the annual growth rate. **The US is capable of sustainably supplying 20 million tons per year or more of pellet fuel.** The US already has nameplate industrial pellet production capacity of over 8.5 million tons per year with another 3.8 million ton per year of production capacity in development. That totals 12.3 million tons per year (data from Argus Direct, December, 2016). Most of the existing production is in relative proximity to export terminals. There are many potential pellet fuel manufacturing locations inland in proximity to PC power stations that could produce industrial pellet fuel.



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FutureMetrics has published a dashboard that allows the user to input assumptions and see the incremental cost of co-firing⁵. **Based on a 10% co-firing ratio of pellets to subbituminous coal, the increased cost is less than three quarters of a penny per kilowatt-hour.**

Conclusion

For a policy that compensates the generators about \$0.007/kWh, the Trump administration could save tens of thousands of coal mining jobs and create tens of thousands of new jobs across the industrial pellet supply chain. The growth of a US co-firing market would spur billions of dollars of investment in new industrial pellet manufacturing plants in the heartland of the US.

And as a by-product, the US lowers the carbon impact of the coal generation sector.

Using pellet fuel in PC power plants around the world consumed about 14 million metric tonnes (15.4 million short tons) of pellets in 2016. Most nations import their pellet fuel (the majority is imported from the US and Canada) as a part of their carbon reduction policies. It is a proven low-cost solution for that purpose.

But for the pellet fuel producer nations, of which the US is the leader, it is an important major industry that supports tens of thousands of jobs.

The new administration could have a major win-win with the coal and forest products sectors if it crafts a policy that allows the blending of pellet fuel with coal in some of our nations coal fired generation fleet; a fleet that currently is, and could be in the future, the backbone of a secure and reliable power grid.

⁵ The dashboard is free and is [HERE](#). You must have Adobe Flash enabled in your browser for the interactive dashboard to work.