"The Role of Clean Energy Standards in International Coal Markets"
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As the world grapples with mounting challenges of energy security and climate change, it is worth recalling a debate over "fair labor standards" which broke out in the 1990s. That debate reflected a concern that investment capital for manufacturing would flow increasingly to low-wage countries with inadequate safeguards for worker safety and health, provoking a "race to the bottom" in the global trading system.

Now the world faces a similar dilemma: will energy producers seek out global markets lacking clean energy standards, in the expectation of evading higher-cost investment in clean energy standards in their own countries?

That concern is particularly acute in the case of coal, the most carbon intensive fossil fuel. In the U.S., the Environmental Protection Agency has issued stringent regulations governing criteria emissions (e.g., mercury) in existing coal-fired power plants, as well as carbon emissions in new coal-fired power plants. In response to these regulations -- as well as the growing displacement of coal by lower-cost natural gas for power generation – coal producers have begun to eye China as a destination for coal mined in the U.S.

Many concerns expressed in the debate over fair labor standards have since proven largely misplaced. With the passage of time, increased economic development has encouraged the growth of improved working conditions in factories around the world.

But time is not on the side of efforts to harmonize global clean energy standards. On the contrary, the longer we wait, the more greenhouse gases we will pour into the earth's atmosphere, and the less chance we will have of bringing global climate change under control before reaching a point of no return. The earth has no chimney. Carbon emissions will continue to accumulate to a point where rising temperatures cause the release of other greenhouse gases (e.g., methane) which are not even a product of the combustion process. At that point, we will all be in trouble.

The international community can take three steps to help assure that the global trade in coal does not become a contributing factor to this downward spiral.

Moving coal up the value chain. Coal can be converted through the process of coal gasification to many different products and byproducts, all of which can add to its value. In addition to generating power, it can be used to produce coke for steelmaking, coal chemicals such as acetate and ammonia, and other fuels, including methanol and di-methyl ether.

But the most valuable byproduct of all of the process of coal conversion may be a waste product – carbon dioxide. Once coal is gasified to produce a synthetic gas, or "syngas," it is possible to separate carbon dioxide on a cost-effective basis from the other

major ingredient, hydrogen. This capacity for carbon "capture" in turn creates opportunities for the "utilization" of carbon dioxide for other purposes -- for example to flush out residual oil from depleted oil wells, or to grow algae as a means of biomass production – or for its permanent "storage" in underground geological sites. In turn, the hydrogen in the syngas can be separated for other fuel uses, including electric fuel cells. These processes combine in an overall approach known as carbon capture, utilization, and storage, or CCUS.

In other words, by adding value to coal, it is possible to reduce its carbon emissions. This is good news for market-based approaches to sustainable energy. The greater the value of the products of coal conversion, the more revenues can be generated to pay for the process of CCUS – and the less net carbon dioxide emissions will result from the combustion process.

International Cooperation. Cooperation in harmonizing global clean energy standards means cooperation in addressing the means to achieve that goal. Those means entail cooperation in research and development, demonstration, and deployment of clean energy technologies.

There is great potential for U.S.-China cooperation in this area. For example, carbon capture, utilization, and storage involves different capabilities, in which the two countries have different comparative advantages. China has a long history of coal gasification, which is the key step in carbon capture. Through further improvements in the process of coal gasification, it can help to make the process of carbon capture cost-competitive with methods of coal combustion which do not capture the carbon. The U.S., in turn, has comparative advantages in geological characterization, subsurface fluid dynamics, and computer simulation. These technologies can be helpful in locating and monitoring processes of carbon utilization (e.g., enhanced oil recovery) and underground carbon storage.

More generally, China and the U.S. come at the process of research, development, and deployment from different but complementary directions. This was made clear in the comment of a U.S. government official to the author of an article in *The Atlantic* ("Dirty Coal, Clean Future," December 2010): "You can think of China as a huge laboratory for deploying technology…They can go from concept to deployment in half the time we can, sometimes a third. We have some advanced ideas. They have the capability to deploy it very quickly. That is where the partnership works."

The author of the article goes on to quote another researcher from a U.S. national laboratory, "Projects like [U.S.-China cooperation on carbon sequestration] are sort of like the school dance…You're not getting married, but you're figuring out how to interact. We need to start the process in a way that gives people the confidence to do it again, and again, and again. The confidence *is* the product. [In its absence,] we'll end up paying twice as much to get the same learnings – and delaying the technology on both sides by another decade."

Next Generation. One of the factors accounting for the gradual improvement of working conditions in factories in emerging economies has been the growing worldwide awareness of consumers, including students, who applied pressure on footwear and apparel manufacturers to address these conditions. The rise of a new generation of leaders in both developed and emerging economies holds forth a similar prospect of growing pressure to strengthen clean energy standards on a worldwide basis.

There are three reasons why the emergence of the next generation of leaders may create new pressures to strengthen worldwide clean energy standards. First, the issue of global carbon emissions affects their own future. They have every reason to want to take ownership of this issue, and to do everything they can to make sure that it does not continue to jeopardize their health and environment and those of their children.

Second, sustainable energy is youth's comparative advantage. Youth are the ones with the new ideas – that myriad of self-created mini-frameworks – that can fit together within an overall framework of harmonized clean energy standards. They can use their imaginations to envision a sustainable energy future and find the ingenuity to invent it.

Third, the issue of clean energy standards provides a possible focus for the proverbial rebellion of youth. In the developed countries, the preceding generation has indulged habits of profligacy and conspicuous consumption, to the detriment of the planet. The next generation is already starting to rebel against its predecessors by rejecting these habits.

How will the next generation of leaders in China react to their parents' and grandparents' legacy of hardship and deprivation? Will they reject this legacy by embracing opportunities for conspicuous consumption that preceding generations never had? Or will they channel their rebellion in a more constructive direction, finding new ways to meet their needs for improved living standards and quality of life without jeopardizing the planet?

The world is engaged in a race against time with global climate change. The U.S. and China have the opportunity to work together to share best practices on energy production, utilization and conservation, engage in joint research, match capabilities and comparative strengths to the common task, and encourage the emergence of a next generation of leaders that can carry the banner of sustainable energy. How they respond to this opportunity will determine whether they can keep this race against time from deteriorating into another "race to the bottom."