



Carbon constraints

Are U.S. states equally prepared for a carbon-constrained world?

The emission of greenhouse gases, especially carbon dioxide, has become a key issue in national energy policy. Domestic energy use and carbon emissions continue to rise while heightened pressure in the United States and internationally suggests that additional changes to the regulatory framework are likely in the coming years.

While it is unclear what form these regulatory changes may take, important perspective on what new regulations might mean can be gained from examining how states might fare in a carbon-constrained world. Mark Snead, economist, vice president and Branch executive of the Federal Reserve Bank of Kansas City's Denver Branch, and Amy Jones, an assistant economist at the Denver Branch, recently researched the issue.

“At issue for state-level policymakers is that carbon restrictions are unlikely to affect all states equally,” Snead says. “Energy use and emission patterns vary widely across states and, as a result, it could mean that states emitting the most carbon or having the most energy- and carbon-intensive economies could shoulder the greatest burden.”

Several of those states, the researchers found, are heavily reliant on farming and energy industries, which means that meeting carbon and emissions constraints could prove to be a formidable challenge at the state level, Snead says.

Historical perspective

The United States is currently moving into what could be characterized as a third phase of its post-war history in energy use and carbon

emissions, Snead and Jones found.

The first phase spans from the late 1940s to around 1979 when energy use was driven by intense industrialization and rapid economic expansion, while energy costs were low and there was little concern about emissions. During that period, total energy use rose more than 150 percent and carbon emissions climbed nearly 125 percent. On a per capita basis, energy consumption increased nearly 50 percent during the 30-year span and produced an increase in carbon emissions from 15 metric tons annually to a peak of more than 22 metric tons.

The phase came to an end, Snead says, as energy prices soared in the late 1970s. It was followed by a period of slower growth in energy use and emissions that ended when energy prices spiked again in 2008. During the second phase, total energy use increased 23 percent and carbon emissions increased about 20 percent. On a per capita basis, energy use and emissions began to stabilize over the period and eventually turned downward. Interestingly, it appears that carbon emissions fell below 18 metric tons per capita in 2009, based on preliminary estimates, a level last seen in the United States in 1965.

Snead says that, based on Department of Energy data, it appears a third phase started after the 2008 energy price spike. Forecasts based on only limited reductions in carbon intensity in the nation's fuel mix suggest the current phase will be characterized by further increases in the levels of both energy use and carbon emissions.

The issue going forward, however, might be on the regulatory front. Although China passed the United States as the world's largest carbon emitter in 2007, the United States still emits four times more carbon per capita than China and 2.5 times more than Europe.

"The high levels of domestic energy use in the United States suggests that the nation is going to have to be a key player in establishing

any successful global carbon-reduction strategy," Snead says.

That means more stringent regulations may be on tap at some point in the future. Snead and Jones focused their work on understanding the potential impact of those changes, if they are applied strictly and uniformly across all states.

Powering up

In their analysis, Snead and Jones compiled a wide range of data that enabled them to rank all 50 states based on carbon dioxide emissions per capita. The results showed some clear regional trends.

For example, several states in the mid-Atlantic and New England regions were found to be among the lowest carbon emitters per capita, with New York, Vermont and Rhode Island ranking the best. West Coast states, including California, Oregon and Washington, also fared well.



EMISSIONS RESTRICTIONS could have an impact not only on factories, but also on farms. Some livestock organizations have voiced concern about the potential affect emissions limits could have on meat producers because of the animal waste.

These states have one thing in common: Unlike other parts of the United States, their energy production is not heavily reliant on coal.

“The low-carbon states tend to be the greatest users of coal alternatives,” Snead says. “Most of New England and the Mid-Atlantic states achieve their emissions advantage by using significant amounts of nuclear power, which is more expensive, but carbon-free.”

West Coast states, meanwhile, benefit from the use of renewable energy, especially hydroelectric power, and relatively mild weather, the researchers said.

Ranking at the top of the list in terms of emissions per capita are states deeply involved in energy production. Wyoming, North Dakota, West Virginia and Alaska each emit

more than triple the national average level of carbon per capita and are at the bottom of the list. For these states, generating a dollar per capita of gross domestic product requires nearly twice the energy of the national average.

“These states have a nearly exclusive reliance on coal for electric power production, a mix of industries that is heavily dependent on energy, and three of them have especially cold and lengthy winters,” Jones says.

Down on the farm

Energy states, however, are not the only places where new emissions standards might have a significant economic impact. Snead and Jones also found that there could be important implications for states heavily reliant on farming with traditional farm states such as

The Tenth Federal District is historically energy- and carbon-intensive. On a per capita basis, carbon emissions in the District are currently 40 percent higher than in the nation. Research shows it’s these states that could be most challenged when it comes to meeting some type of federal emissions standards.



Percentage Change of Carbon Dioxide Emissions Per Capita in the Tenth District from 1990-2007	
Colorado	0.5
Kansas	0.8
Missouri	17.3
Nebraska	18.3
New Mexico	-13.9
Oklahoma	7.4
Wyoming	-3.1
Tenth District States	3.4
United States	-1.3

Sources: U.S. Department of Energy, Bureau of Economic Analysis, Environmental Protection Agency and Kansas City Fed calculations.

Nebraska, Kansas, Iowa, Indiana and others heavily involved in crop production ranking in the top 15 in terms of carbon emissions. Because the production of crops such as corn, soybeans and wheat is energy intensive, requiring tractors and combines for production as well as trucks and rail for transport, Snead says reducing carbon emissions in this crop-producing farm states could prove “exceedingly difficult.”

of energy relative to other states and rely heavily on coal in electricity production,” Snead says.

He adds that Alaska and Louisiana may also face challenges, but they have been able to mitigate their risks to some degree by limiting the carbon content of their fuel mix.

Perhaps the biggest current issue, especially at the state level, is the fear of the unknown. Snead and Jones note for state policymakers, one concern might be that they ultimately



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The potential impact is also not limited exclusively to farmers who produce row crops. Livestock organizations have also voiced concerns about potential limits on meat producers related to the emissions produced in livestock production, including animal waste, particularly methane.

lose control over many decisions related to emissions to federal mandates that would effectively dismantle state efforts. Conversely, at the federal level, there is the issue of balancing the state-level differences illustrated by Snead and Jones.

Who's ready?

While Snead and Jones do not venture into issues, such as the debate on global warming or the role of methane-producing cattle, their analysis does reach some conclusions about economic growth, carbon emissions and energy use that suggest which regions may be the best—and worst—positioned to meet some type of federal emissions standard.

Not surprisingly, the same regions with low emissions—New England, Mid-Atlantic and the West Coast—appear to be the best prepared. Places that could struggle include states such as Alabama, Kentucky and West Virginia, which may use less energy than other states but might suffer because of the fuel mix. Snead and Jones note three states that face the greatest risk: North Dakota, West Virginia and Wyoming.

All three “use exceptionally high amounts

FURTHER RESOURCES

“ARE U.S. STATES EQUALLY PREPARED FOR A CARBON CONSTRAINED WORLD?”

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