



M. Granger Morgan is head of the Department of Engineering and Public Policy at Carnegie Mellon University, Pittsburgh, PA. E-mail: granger.morgan@andrew.cmu.edu

Don't Grandfather Coal Plants

THE UNITED STATES, THE WORLD'S LARGEST EMITTER OF CARBON DIOXIDE (CO₂), GENERATES about half of its electricity by burning coal. In terms of capacity, the average coal plant is just over 30 years old. Although most have been renovated and upgraded, there is no escaping the fact that these plants are aging, and sooner or later many will have to be replaced. Since 2002, the U.S. Department of Energy's National Energy Technology Laboratory (NETL) has tracked the plans of U.S. electricity generators to build new coal-fired power plants. They report plans to build 154 gigawatts (GW) of new coal plants over the next 24 years, and 50 GW in just the next 5 years, a big jump from the 6 GW built during the past 5 years. Age is only one reason for this expected boom in new coal plant construction. In recent years, natural gas has been the fuel of choice for new power plants. High and volatile gas prices are now contributing to what NETL calls "the resurgence of coal." However, for each kilowatt-hour generated, coal plants emit roughly twice as much CO₂ as gas plants. If the United States builds a large number of new very long-lived coal plants, reducing future emissions of CO₂ will become vastly more expensive than it needs to be.

Why should the United States limit emissions, given that other major CO₂ emitters, including China, are not doing so? Although other nations are adding coal power too, unless the United States takes action, other nations, especially industrializing nations, cannot be expected to follow.

Most U.S. utility executives believe it likely that CO₂ emission constraints will be imposed in the United States within a decade. No one knows exactly what form they will take, although economists argue for a gradually escalating tax on every ton of CO₂ emitted. But in U.S. politics, "tax" is a dirty word, so a more likely strategy is a cap-and-trade system with emission permits. Those permits will have to be allocated to start the process, and some planners of new plants may hope that their allocations will be proportional to their generators' emissions when regulation begins. Because permits will become more valuable as their numbers gradually shrink over time, that allocation scheme could hand a future windfall to firms that built substantial new capacity now. Of course, another possible approach to emission constraints would be to mandate controls only on new plants, while exempting existing plants for some extended period on the grounds that firms would otherwise face large "stranded costs." Some investors may be counting on this or on the hope that such costs could be passed on to electricity rate-payers.

Although a number of U.S. states are moving to control CO₂ emissions from power plants, federal regulation is probably unlikely for the duration of the Bush presidency. However, with the changed political complexion of the Congress, federal legislation might be possible, stipulating that when CO₂ controls are imposed, no plant built after 2006 will be exempted from coverage (that is, grandfathered), no matter what form future controls on emissions may take. Such a law would not prevent the construction of new coal plants but would strongly encourage builders of conventional coal plants to design them so as to permit amine-based CO₂ "scrubbers" to be added later. It would also provide an incentive for those building new plants to adopt advanced "clean coal" technology such as integrated gasification combined-cycle or oxyfuel plants that can capture and sequester CO₂ in deep geological formations.

Federal legislation would clearly be best. But if that is impossible, a number of state legislatures might adopt such laws. A state-by-state approach is not optimal but could clearly place future liability on investors, not rate-payers, and thus send a clear message to those planning new plants and help to create political momentum for subsequent action at the federal level.

— M. Granger Morgan



Downloaded from <http://science.sciencemag.org> on May 23, 2019

Science

Don't Grandfather Coal Plants

M. Granger Morgan

Science **314** (5802), 1049.
DOI: 10.1126/science.1135210

ARTICLE TOOLS

<http://science.sciencemag.org/content/314/5802/1049>

RELATED CONTENT

<http://science.sciencemag.org/content/sci/315/5820/1791.2.full>

PERMISSIONS

<http://www.sciencemag.org/help/reprints-and-permissions>

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. 2017 © The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. The title *Science* is a registered trademark of AAAS.