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"CONFLICTS AND UNINTENDED CONSEQUENCES OF MOTOR FUEL STANDARDS"

by

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Good Afternoon, Chairman Harris, Ranking Member Miller, and Members of the Committee. Thank you for the opportunity to appear before you.

Introduction

My name is Jay Kesan. I am a Professor at the University of Illinois at Urbana-Champaign and the Program Leader of the Biofuel Law and Regulation Program at the Energy Biosciences Institute, a joint research effort between the University of Illinois, the University of California, Berkeley and the Department of Energy's Lawrence Berkeley National Laboratory and funded by BP as a multi-year research commitment.

The Renewable Fuel Standard (RFS) Program

In 2005, the U.S. Congress passed the Energy Policy Act, which charged the Environmental Protection Agency (EPA) with developing and implementing the Renewable Fuel Standard Program (RFS). The RFS was designed to ensure the introduction and consumption of a certain volume of renewable fuel in the Unites States. More specifically, under the RFS Program, obligated parties such as gasoline producers and importers were required to produce or purchase a specific amount of renewable biofuel every year between 2006 and 2012.

The RFS was significantly altered in December 2007 with the passage of the Energy Independence and Security Act of 2007, and the expanded Program is now commonly known as RFS2. Under the RFS2, the period of volumetric requirements is extended through 2022, and renewable fuel is sub-categorized into traditional renewable fuel, advanced biofuel, cellulosic biofuel, and biomass-based diesel based on fuels' feedstocks and the green house gas (GHG) emission reduction thresholds that they satisfied.

There were three main policy goals that drove the RFS legislation – national energy security, reduction in GHG emissions, and economic development, particularly in the rural

sector. All three of these drivers are definitely still with us today and will continue to remain important in the foreseeable future.

The Economic Rationales for the RFS2 Program

The RFS program is designed to facilitate the substitution process of domestically-produced, renewable biofuels for petroleum, and to make renewable fuel economically viable in the future. In order to achieve this main goal, gasoline producers and importers are required to commercialize their obligated amount of renewable biofuel every year during the period between 2006 and 2022. These parties -- not the government and consumers -- are responsible for introducing renewable biofuel into the U.S. market. In essence, the policy instrument of the RFS is a mandatory demand regime that requires gasoline producers and importers to commercialize more renewable biofuel than the amount the market would achieve in the absence of the RFS.

How does such a large scale mandatory demand regime like the RFS help reduce production costs of renewable biofuel over time? This is well understood, and several mechanisms can be found in light of well-established economic theory. First, economies of scale and/or Marshallian externality contribute to improving production cost conditions. A possibility of large-scale mandatory consumption allows renewable biofuel producers and their feedstock suppliers to operate at a large scale. Then, large-scale operation decreases their average cost of production. In particular, when the fixed cost of physical capital is very high, this effect is likely to kick in. High fixed costs are not limited to physical capital, and they may equally apply to R&D expenditures. Thus, large scale demand raises the profitability from R&D activity, and, as a result, promotes technological advancement. Similarly, large scale mandatory demand improves the infrastructure of the renewable biofuel industry. This externality positively affects the cost conditions of each producer involved in the biofuel industry.

Second, the RFS2 program induces biofuel producers and their feedstock suppliers to invest in R&D activities creating cost-saving innovation. The basic logic of this relies on the

well-established idea of "market pull" or "cost spreading". In the context of the RFS program, a renewable biofuel producer reaps the benefits of cost-saving innovation by embedding them in biofuel technology and then selling biofuel as a final product. While his R&D expenditures are a fixed cost, the marginal benefit from such R&D is proportional to biofuel sales. That is, the producer benefits more from cost-saving innovation as its sales increase. Thus, the possibility of large scale biofuel sales, brought about by the RFS, gives biofuel producers an extra incentive to invest in the R&D that creates cost-saving innovation. In addition, large-scale mandatory consumption provides incentives to new market entrants. Therefore, higher levels of market competition require more cost-saving innovation in order to survive. In such cases, technological advancement might not necessarily come with a larger scale of production. However, it is surely the case that costs are lower with improved production technology.

Our empirical work analyzing ethanol plants in the past decade indicates that the RFS has contributed to increasing economies of scale and to improving the level of competition among firms through existing plant expansion as well as expansion through new plant construction.[1]

Finally, uncertainty influences investment decisions regarding R&D activity. In general, returns to R&D investments are quite skewed, and firms may find it difficult to finance R&D expenditures through the capital market. Thus, removing some degree of uncertainty by creating several years of a mandatory demand regime makes it easier for biofuel producers to finance their R&D projects. Furthermore, according to option value theory, firms may postpone R&D projects because of great uncertainty even if the net present value of the project is not negative. As mentioned previously, the returns to R&D investments partly depend on demand conditions. Since the mandatory demand of the RFS guarantees a market to biofuel producers, it reduces the degree of uncertainty. This in turn leads to lowering discount factors associated with uncertainty of benefits derived from R&D projects. In sum, the RFS encourages R&D

[1] J.P. Kesan, A. Ohyama, and H.-S. Yang, "An Economic Evaluation of the Renewable Fuel Standard (RFS) Standard Program: An Industrial Policy Approach," Working Paper, available on SSRN, http://www.ssrn.com (2011).

activity in the industry by easing credit constraints or lowering the value of postponing R&D projects.

The amount of money spent on R&D is lower than the amount of money that biofuel producers need to spend to build commercial production facilities, and thus the uncertainty and risk of an unstable policy has an even bigger impact on commercial investments because the costs are so much higher. On the other hand, a stable commitment to the RFS2 regime reduces that uncertainty and risk associated with commercial investments.

Other regulatory initiatives such as the E15 and E85 programs work in tandem with the RFS2 to facilitate innovation and further development of the biofuel industry. In addition, efforts to clarify regulations by removing some of the uncertainty about the approved level of blending for biobutanol is another positive initiative that can work with the RFS2 Program and further expand the development of advanced biofuels such as biobutanol.

Consider another example from another renewable energy sector – the case of wind energy. I have attached a graph to my written statement that shows that investment in wind energy has been stable and growing rapidly in the past decade whenever there has been a stable tax policy in place. This once again illustrates the importance of a firm and stable policy commitment instead of intermittent policy initiatives.

We are in an era of heavily constrained government funding. Policy initiatives like the RFS mandates do not require government money. Rather, we are simply facilitating innovation and commercialization of new technologies by reducing some uncertainties by providing a guarantee of market demand.

It is worth noting that similar regulatory regimes in other arenas designed to advance and facilitate the development and deployment of new technologies have a long and successful history. Such examples include automobile airbag technology, digital broadcasting, enhanced 911 calling and the like.

Taking Stock of Where We Are Today and Looking Ahead

We are starting to see the RFS program begin to yield tangible results on the ground in terms of producing advanced biofuels and cellulosic biofuels. For instance, the commercial investments in biofuels derived from lignocellulosic biomass are real. There are credible players in the industry such as INEOS, Abengoa, POET and BP breaking ground on new plants and projects this year and in 2010.

I am an engineer and a lawyer. But my esteemed colleagues at the Energy Biosciences Institute (EBI), who are world-class experts in the plant sciences tell me that scientific advancements have already solved the problem of obtaining sugars from lignocellulosic biomass many, many times. Therefore, it is now only a matter of technological effort and time, together with the encouragement and support of a foundational policy such as the RFS, before we achieve large-scale production of advanced biofuels.

Relatedly, the U.S. has a substantial land base beyond that used for row-crop agriculture that can be mobilized to achieve substantial domestic biofuel production and meet all the biofuel mandates of EISA/RFS2.[2]

There is extensive research showing that "learning by doing" lowers the production cost of biofuels. This has been shown to be true for corn ethanol and sugarcane ethanol. The RFS is a cornerstone piece of legislation for the biofuel industry. The RFS mandates will accelerate the production of advanced biofuels and lead to more cumulative experience and promote the innovation needed to lower production costs in the future.

The National Research Council report on the RFS is not a conclusion on the biofuel industry and is, more accurately, a report on a work that is still in progress. In fact, the NRC report is based on rather outdated information. For instance, it is not based on current

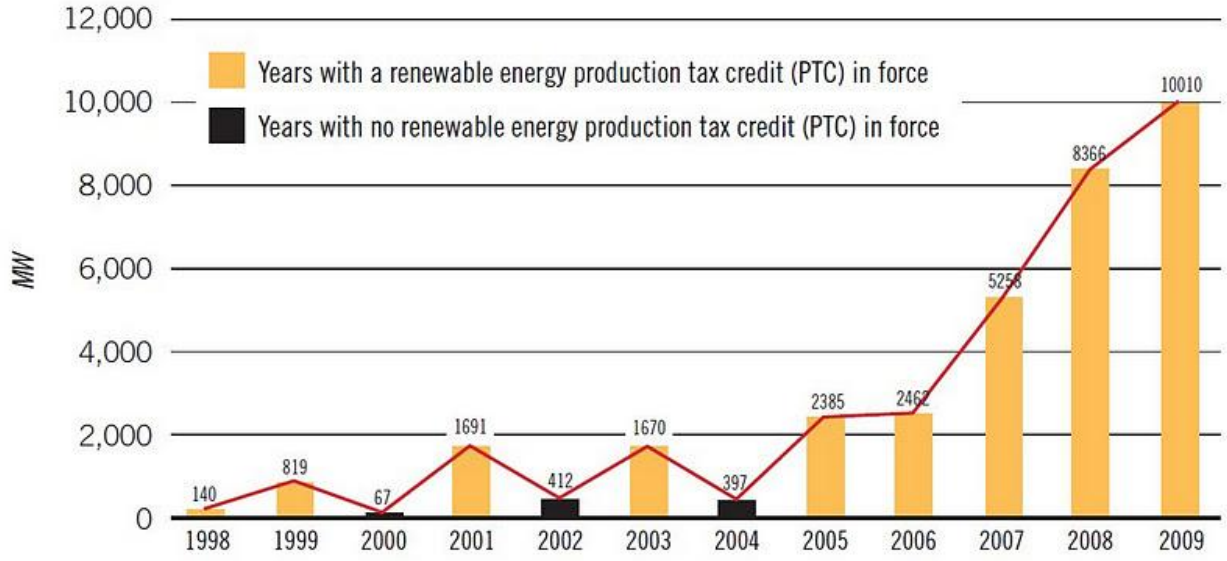
[2] C. Somerville, H. Youngs, C. Taylor, S.C. Davis, and S.P. Long, "Feedstocks for Lignocellulosic Biofuels", *Science*, vol. 329, pp. 790-792 (13 Aug. 2010); Huang, H., M. Khanna, and X. Yang, "Economic Implications of Energy Crop Production on Conservation Reserve Program (CRP) Land" presentation at AFRI Meeting on *Prosperity for Small and Medium-Sized Farms* and *Rural Communities* Programs, Miami, Florida, November 7-9, 2011.

biomass production estimates or on current technological information. That said, the NRC report does correctly acknowledge that commercializing advanced and cellulosic biofuel technologies will require policy certainty.

We need a broad-based approach to energy policy in the U.S. and biofuels will play a significant role in our national energy portfolio. We need important policy mechanisms such as the RFS to ensure that we have new energy options. A healthy market is one that has a broad set of biofuel producers and, more broadly, a diverse portfolio of renewable energy options, including solar, wind, natural gas, hydroelectricity, and biofuels.

Thank you very much for your attention. I am happy to answer any questions that members of the committee may have.

Net Annual Installed Wind Power Capacity in the United States, 1998–2009



Source: American Wind Energy Association