Clean Energy 2011

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President Obama said in May 2011, "We're in a competition all around the world, and other countries …know that clean energy technology is what is going to help spur job creation and economic growth for years to come." Federal energy subsidies, fueled mostly by stimulus spending, reflected his priorities by growing from $17.9 billion in FY 2007 to $37.2 billion in FY 2010.[1] The policy mix includes direct expenditures, tax expenditures, and the subsidy associated with loan guarantees. For example, cumulatively from September 2009 through November 2011, the Department of Energy (DOE) underwrote $35.9 billion in loan guarantees for a range of energy-related technologies.[2]

One rationale for scaling up clean energy technologies at the taxpayer's expense is that they can reduce greenhouse gas emissions, which aren't controlled by other policies. A second rationale is the thought that strategic investments in clean energy technologies can hasten the weak recovery and improve U.S. competitiveness by driving resources toward a fast-growing sector of the world economy. While a case can be made that subsidizing clean energy might reduce pollution, the case for many subsidies may be narrower than some assert, and turning theory into sound practice is no simple feat. The notion that clean energy industrial policy can increase long-run employment and economic growth is more debatable.

[1] U.S. Energy Information Administration, "Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2010," August 1, 2011. http://www.eia.gov/analysis/requests/subsidy/

[2] U.S. Department of Energy (DOE), Loan Programs Office website, accessed November 29, 2011. https://lpo.energy.gov/?page_id=45. The overall value of loans guaranteed by DOE is much larger than the appropriations necessary to account for the value of the subsidized interest rate on the guaranteed loan.

Let's take the environmental case for clean energy subsidies first. The evidence is clear that no subsidy policy is a substitute for a price on carbon, for example from a carbon tax or a cap-and-trade system. To illustrate, a recent modeling study estimates that tax credits for energy efficient household capital would produce 1/20 of the carbon emissions reductions that a similar-sized carbon tax would produce.[3] This is because unlike a tax credit for new, more energy efficient equipment, a price on carbon incentivizes emissions abatement from all activities quickly, prompts electricity producers to use lower-carbon fuels, and doesn't create savings that households use to purchase more energy. A carbon price would help level the playing field for greener energy sources by requiring emitters to pay prices that reflect the costs their emissions impose on society. Those costs would flow to purchasers of goods and services that require energy, inducing more conservation. Emitters would have incentives to invest in equipment and new production techniques, use alternative fuels, and seek other methods to reduce emissions. And America's innovators would channel their efforts into inventing, scaling up, and marketing competitive forms of clean energy.

However, particularly until Congress imposes a reasonable price on carbon, cleaner substitutes warrant federal investments. The strongest case is in basic research and early development of clean energy and energy-efficient technologies, since firms tend to under-invest in these activities anyway. In the period before an appropriate price on carbon, it might also make sense to encourage investments analogous to those that firms would undertake if carbon were properly priced, i.e. investments in technologies with the lowest expected cost of abatement and highest probability of market penetration. However,

[3] McKibbin, W., A. Morris. and P. Wilcoxen, "Subsidizing Energy Efficient Household Capital: How Does It Compare to a Carbon Tax?" *The Energy Journal*. Vol 32. 2011.

current spending doesn't look like that. For example, of the nearly $40 billion in loan guarantees in the stimulus package, over 43 percent went to two sectors that offer some of the highest costs of carbon abatement and the lowest projected market shares: solar power and electric vehicles. Of course the loan guarantee program is only one vehicle in a convoy of spending programs, but it does suggest the potential to reallocate efforts to technologies that might have the strongest prospects under sensible climate policy.

Now let's consider the claim that clean energy policy can help spur job creation and economic growth, as proponents suggest. Of course, energy policies can affect the fortunes and employment levels in individual industries. But some believe strategic policies could enable U.S. firms to get a leg up on foreign competitors, develop intellectual property, and thereby gain the advantage of being a "first mover." Not necessarily. Firms already have the incentive to develop profitable technologies and use patent protection to maximize their payoffs. The question is whether there is a public-policy case for subsidizing these companies. To make sense, the policy would have to render these firms more profitable such that they yield a beneficial economic spillover sufficiently large to justify the subsidies' cost. In theory that might be possible if, thanks to the government's support and intellectual property protection, U.S. companies could capture world markets at the expense of foreign rivals and generate profits or economic activity at home that otherwise wouldn't occur. However, it's not clear that the clean energy market is likely to advantage the first countries that subsidize or mandate the new technologies. It is just as plausible that greater gains derive from following instead of leading. After all, global demand for clean energy (unlike many other sectors that taxpayers could subsidize using the same logic) is a function of fickle environmental

policies that spur adoption of what might otherwise be uneconomic technology. Further, pushing home-grown technologies at taxpayers' expense offers no guarantee that the eventual products ultimately won't be manufactured somewhere else, since the global market forces that drive the manufacturing location of other technologies apply to clean energy technology, too. Indeed, the willingness of other nations heavily to subsidize their clean-tech industries, thereby lowering the costs of clean energy, could benefit both the U.S. economy and the environment.

Might promoting green jobs and clean technology spur growth amid the current economic stagnation? In this situation, the relevant question is how spending related to energy stacks up against other forms of fiscal stimulus. It depends on how "timely, targeted, and temporary" the spending is. By these criteria, much clean energy spending falls short. A major energy project requires time for detailed proposals, competitive contract selection, and negotiations over the scope of work. Research and advanced demonstration projects are hard to scale up quickly, in part because they use skilled labor that is already in high demand. The imperative that stimulus spending be temporary (so it doesn't crowd out other economic activity when resources aren't slack) also doesn't fit a well-structured energy policy portfolio. Government should invest in technology development based on the long-range merits, not how it fits in the business cycle. The most effective stimulus spending on energy could be the energy efficient retrofits for low-income households, which can employ laid off construction workers and benefit those with a high marginal propensity to consume.

Even when there is a sound economic case to fund clean energy in principle, it's all but impossible to insulate the investments from political pressures that distort

investments that are already risky given volatile commodity markets. The joint vagaries of political whim and market forces have left a trail of expensive policy failures. While policymakers have had some successes, the history of the Department of Energy's (DOE) RD&D projects has been checkered since the early 1970s. After the first Mideast oil shock in 1973, various alternative fuel programs were proposed but proved problematic. For example, President Carter and Congress created the Synthetic Fuels Corporation that was envisaged to spend up to $88 billion ($200 billion in 2007 prices) and to produce an ambitious two million barrels a day by 1992. Some plants were completed at a cost to taxpayers of about $4 billion (2010 dollars), but they never operated commercially. The Clinch River breeder reactor project cost taxpayers $3.9 billion in today's dollars. It was abandoned in 1983, and none of the subsidized reprocessing plants became commercial operations. Some more recent federal efforts to fund energy technology have seen similar failures and false starts. For example, from 2004 to 2008 the federal government sank $1.2 billion into hydrogen vehicle programs that so far have produced no commercial deliverables.[4]

The failure of Solyndra in August 2011 illustrates the continuing array of economic and political challenges. The California solar firm went bankrupt after receiving over $500 billion in federal loan guarantees. Solyndra's market edge, hailed at first by analysts, was that it avoided the need for expensive polysilicon. But when the price of polysilicon plummeted and Chinese subsidies lowered the costs of polysilicon-based photovoltaics by nearly 50 percent, Solyndra was left hanging. Perhaps riling critics most, the Obama Administration subordinated Solyndra's federal debt to other creditors

[4] Mufson, Steven, "Before Solyndra, a History of Failures," *The Washington Post*, November 13, 2011, p. B4.

when it doubled down on what turned out to be a bad bet. Despite the fact that the loss on Solyndra is a tiny share of the overall loan portfolio, the appearance of politically motivated investments has created lingering partisan bickering that prevents a reasoned debate on energy technology policy.

So what should policymakers do? First, there's no substitute for a modest but significant price on carbon. Without a price on carbon, clean energy subsidies can only go so far to counteract the market advantage of cheaper fossil incumbents. And with a responsible price on carbon, market demand would drive deployment of the lowest cost abatement strategies so federal spending can concentrate on more basic research and development. Second, inasmuch as DOE remains in the business of energy technology development, it should target dollars to investments with the greatest potential to reduce environmental damages at low cost. This means an explicit focus on intervening where there's a clear case that market outcomes aren't efficient, and otherwise leaving well enough alone. It also means insulating spending decisions from political winds by establishing independent expert panels to review proposals. Finally, DOE should collect and analyze comparable data on the performance of the wide array of its programs to learn what works well and what doesn't, and it should use those results to improve its portfolio.[5]

[5] For more discussion on data and program review, see Jaffe, A., R. Newell, and R. Stavins, "A Tale of Two Market Failures: Technology and Environmental Policy," Ecological Economics 54 (2005) pp 164-174.