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The Apollo Fallacy and its Effect on U.S. Energy Policy

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Abstract

US Policy makers have made continual references to the Apollo Program as a model for development of alternative energy technologies. This model, however, is inappropriate for energy policy, and its use is termed the Apollo fallacy. The goal of the Apollo Program was the demonstration of engineering prowess while any alternative energy technology must succeed in the marketplace. Several Apollo-like energy programs have been tried and all have failed at high cost. It is argued that the use of Apollo has political benefits but that it is detrimental to the adoption of potentially effective energy policies.

Keyword

Energy policy (US)

According to many proponents, alternative energy development requires an Apollo Program type government commitment. In fact, the analogy to the Apollo Program (or to the Manhattan Project) has been repeatedly relentlessly in America's public discourse. From President Nixon's explicit evocation of Apollo in launching Project (energy) Independence in 1973,[1] to President Obama's references to Apollo on the campaign trail in 2008,[2] no image has been used more often with respect to energy development, particularly the development of alternative energy technologies.

Apollo has already served as the model for many major alternative energy programs. Just as President Kennedy announced early in the 1960s that the US would put a man on the moon by the end of the decade, so other US presidents have embarked on grand alternative energy schemes to achieve *x* by time *y*. These efforts have never succeeded and have cost literally billions of dollars. Current programs such as the ethanol mandate of 2007 are likely to waste still more billions in the years ahead (Hahn, 2008; Grossman, 2008).

The Apollo analogy is, in fact, both inapt and unhelpful to the creation of effective energy policies. The analogy, or what I call "the Apollo fallacy," conflates an *engineering* problem with a *commercial* problem, and it deflects efforts away from scientific advance and focuses them instead on grandiose social results. The goal of Apollo was simply to prove that the US could accomplish the spectacular achievement of putting people on the moon and bringing them home safely. Cost was not consequential nor was the feat meant to become a regular function of the marketplace. Certainly, President Kennedy never stipulated that lunar vacations become an ordinary consumer choice. Indeed, if the goal of Apollo had been to create cost effective commercial lunar tourism, it would have to be judged a colossal waste of money.

Alternative energy technologies, however, are intended to be more than demonstration projects. Most of these technologies can already be engineered. Synthetic fuels, solar thermal hot water heating, solar photovoltaic electricity, electric automobiles, 80 m/g (approximately 35 km/L) autos, cellulosic ethanol have all been demonstrated. The goal of government programs has been to make these programs commercially viable. That is, every program has set out to create a new technology that would be cost competitive with the conventional technology or resource it was intended to replace.

But often government programs have actually retarded commercial development of the technologies they were supposed to advance. In 1977, for example, President Carter asked for tax credits to promote home solar thermal hot water and space heating systems. His stated goal was the installation of 2.5 million units by 1985.[3] This effort actually hurt the solar industry. The program was announced in April 1977 but passed in November 1978. Consumers waited for passage of the tax law, which caused serious losses in the meantime for producers (Business Week, 1979). But their distress in the mid-1980s was far greater when markets showed that most of the assumptions on which Carter's policy was based were wrong. Contrary to the government's expectations, the price of conventional resources did not rise; in fact they fell significantly. And the technology did not advance sufficiently to make consumers confident that they would have value for their investment. Even before the tax breaks were eliminated in 1986, it was clear that the original goal would not even be approached. According to an industry history, few manufacturers survived by the end of the decade.[4]

It should be noted that the Carter administration did not explicitly link solar energy development to the Apollo Program until several months after passage of the tax credits,[5] but the program was Apollo-like in its over-ambitious technological-commercial goal with a timetable to achievement. In general though, programs like solar heating, and now electric cars, have tried to alter the energy marketplace through un-Apollo-like incentives directly to consumers. Still, government forecasts for such programs have been extravagant, unrealistic and seemingly oblivious to the actual processes of technological adoption. While an argument can be made for the use of tax credits for some types of energy projects (particularly for R&D itself), their successful use in a consumer program is necessarily uncertain because technological adoption rests on the consumer's belief both that the new technology will be cost effective and that it will perform well over time. Cost effectiveness is not, as the solar program demonstrated, guaranteed by tax preferences; even with tax breaks consumers will be cautious about spending thousands of their own dollars. And operating performance can only be assessed after years, often decades of experience. In fact, experience with other technologies suggests that even if the forecasts of cost effectiveness had been correct, most consumers would have waited to purchase until solar's long-term operating efficiency had been demonstrated.[6]

Other US government alternative energy programs have more directly followed the Apollo model: through legislation, significant sums of money have been appropriated to force the creation of commercially viable energy alternatives. This model has been followed most notably with synfuels, nuclear fusion, and the 80 m/g "super car." In each case, large sums were authorized and timetables set with specific benchmarks of achievement. Each of these technologies was expected to achieve large-scale displacement of conventional resources or the technologies that used them. Yet like the incentive-based solar program, all failed to achieve their objectives and the programs were downgraded or eliminated as costs mounted and results proved disappointing.

The failure of the "super car" is instructive as to the limits of the Apollo model, which was specifically invoked in a press release from the Clinton White House when the effort was launched in 1993.[7] The program, a partnership of government and the big three US automakers, was supposed to create a new kind of car that would supplant the standard internal combustion family car. With $1.5 billion in development funds, the partnership for a new generation of vehicles (PNGV) was to have produced an affordable 80 m/g car by 2004. After the program was shuttered in 2001, the National Research Council declared that no "reasonable" amount of additional funding would get the project any closer to achieving its original goal; the project needed "breakthrough ideas" that more money simply could not buy (National Research Council, 2002).

The Apollo fallacy has been detrimental to the development of effective energy policies in the US instead of asking what kinds of programs might be useful, the government holds out the promise of a technological panacea to be delivered simply by an act of Congress. The prospect of an energy panacea actually has some political benefits (Grossman, 2009).[8] It allows politicians to claim that they can provide simultaneously the two outcomes most Americans seek from energy policy: low energy prices and energy independence. In fact, with conventional resources these goals are mutually exclusive. To get low prices, the government should provide incentives to drill for oil and gas not just in the US but also in places where they might be exploited more cheaply—of course making the nation more dependent on outside sources. To lessen dependence (true energy autarky is not a feasible goal) on foreign resources, the only method the government can use with conventional resources is to raise prices through taxes. But a new technology presumably can do both at once: provide cheap, US-made energy (Grossman, 2009). Unfortunately, the history of energy programs argues that the pursuit of a technological-commercial panacea will fail.

This suggests the need for a more modest kind of energy program. Instead of unrealistic goals set at millions of units, tax credits might simply be presented as a way to encourage substitution when market conditions generally are favorable. Instead of grand schemes, the government can expand (and sustain) research budgets to fund a variety of ideas both for new technologies and for such mundane efforts as efficiency improvements in conventional technologies. A study of the costs and benefits of government energy spending from 1980 to 2000 found that large benefits came from research to improve the efficiency of refrigerators and window insulation (Fri, 2006).

The government can take one kind of action that might over time encourage commercially viable alternative energy products: impose significant taxes on conventional resources. This would give inventors and entrepreneurs confidence that any technological gains would not simply be swallowed up by price changes in conventional resource markets. Of course, such tax policies while providing incentives do not guarantee innovation. High prices are at least as likely to lead to conservation as innovation. In any case, on a practical level, it is doubtful that there exists the political will in the US to impose them. President Clinton's effort to increase gas taxes by just 4.3 cents/g faced significant political opposition and was a contentious campaign issue in the 1994 and 1996 elections (Sullivan, 2008).

Perhaps the most crucial role for government is in creating the institutional environment that will allow innovation to succeed. As scholars in many disciplines have noted, rules—customary practices as well as formal laws—can block market access to new entrants or lead to technological lock in, thwarting adoption even of innovations that could be commercially viable.[9] Changes in US laws on market access to decentralized electrical generating sources, for example, have to some extent improved the prospects for wind energy development in the US. At the same time, access across the US is not entirely uniform since it depends not only on national law but also on state and local laws and on social attitudes, any of which can halt the diffusion process (Bohn and Lant, 2009). Clear and uniform rules would probably improve wind energy's prospects but even that may not be enough in places where there are significant social barriers to adoption.

Still, as most researchers understand, technological-commercial progress is not guaranteed with favorable rules or with taxes or with an expanded research agenda or, as this paper has argued, with grandiose visions and massive appropriations. Politicians may make innumerable references to the Apollo Program and pass laws relating to energy accordingly, but the references and the laws will not mean that any of their goals are achievable. The Apollo moon landing was a magnificent feat, but one that carries essentially no useful lesson for energy policy-making—except perhaps the lesson that it does not apply.

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