The reasons for this gap are many. One is that the public benefits, such as national security or environmental quality, are simply not fully reflected in market prices. Another is that private firms are finding it increasingly difficult to recoup their R&D costs by appropriating exclusively to themselves the true benefits of the R&D. In today's highly competitive global market, technical secrets are shortlived and too easily stolen, scientists are hired away, and inventions are slightly modified in order to circumvent intellectual property rights. More fundamentally, the R&D itself is often too challenging, requiring large interdisciplinary teams of scientists, working year after year on expensive and unique laboratory equipment. Finally, the structure of certain industries is often too fragmented, or the firms too small, to mount the sustained R&D campaign necessary for success.

Within this context, the proper role for the U.S. Department of Energy's applied R&D programs is *not* to subsidize or displace private sector responsibilities for R&D, but to complement them selectively in ways that will help achieve important longterm public policy objectives and that are justified by one or more of the special market circumstances outlined above.

What Successes?

So, after nearly two decades of investing in such R&D at the U.S. Department of Energy, is it fair to ask "What benefits have accrued to the U.S. economy?"

Yes, it is-and the answer is impressive. Many outputs of the Department's R&D, conducted in pursuit of its public policy objectives, not only have had substantial economic success in the marketplace, but also have proven to be fundamentally important in one technical area after another in positioning U.S. industry at the forefront of global competition. In today's markets, winning products are often those with technically driven advantages in performance and price, and the Department's R&D has contributed significantly to many of these winning products.

Among such products is the electronic ballast for fluorescent lighting fixtures that has become the lighting technology-of-choice. It has already saved U.S. electricity consumers $750 million, a saving that grows every day. Another technology, low-emissivity window coatings, has gained a 34% market share of all new double-glazed residential windows.

And, the economic benefits of the Department's programs will continue well into the future. Four technologies in one building technologies R&D program are expected to net more than $16 billion in economic savings to U.S. taxpayers by the year 2015, far outstripping the total past and projected Department of Energy investments in this area of R&D.

These statistics may surprise some critics of the Department's R&D programs. Many of the Department's most important R&D contributions lie in the "precompetitive" stages of technology development, or in important intermediate technology components, and such contributions are often hidden in the final product. Many people might recognize the technological sophistication of modern commercial trucks and diesel engines, Boeing 757 and 767 aircraft, and high-efficiency lights, windows, and appliances; but few would realize that Department of Energy technology is inside those products and is responsible, in part, for their fast-growing global market shares.

To be sure, the Department has embarked on some R&D activities without yet achieving the desired results, and some of these are highly visible and costly. As with most high-risk ventures, targets cannot always be met, both in private and public sector R&D programs. The purpose of the Department's R&D programs is to explore these high-risk technical possibilities.

Many of the bold experiments in energy demonstration projects of the late 1970s, motivated by global