ECONOMICS
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The Energy Efficiency Technology Resource

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- The energy efficiency gains achieved in the U.S. since the 1970s – including a 50% decrease in total energy for every dollar of value-added – are very impressive.
- Despite the claim that all energy efficiency gains have been exhausted, energy efficiency resources and technologies still remain a worthy investment.
- Increased efficiency, in fact, may be critical to a long-term economic development.

Since 1970, changes in technology and market structure have accelerated the rate of decline in the nation's energy intensity. In 1970 our economy used about 18,000 British thermal units (Btus) of total energy for every dollar of value-added produced in the United States. Today we use less than 9,000 Btus. Broadly speaking, energy efficiency technologies now provide 75 percent of all U.S. demands for energy services (Laitner 2006). Despite the significant contributions from these past energy efficiency gains, however, there is a tendency in economic models and conventional policy analyses to assume that any new energy efficiency investments will make only a limited contribution to our nation's energy future. And even when such improvements are thought actually to be possible, the standard logic suggests that any further energy efficiency gains are not likely to be "cost-effective."

The operative assumption of this particular mindset is that we've pushed the efficiency frontier as far and as fast as it can reasonably go. The good news, however, is that the evidence points to a very real prospect for new and substantially greater gains in energy efficiency – especially when one explores the role of government and industry as both innovators and champions of new and more productive energy technologies. The evidence suggests, moreover, that energy efficiency improvements do not have to be about ratcheting down the economy. Instead, they can be about providing new services, making new products, and providing new ways to both work and play. Some analysts believe, in fact, that increased energy efficiency may be critical to a long-term sustainable development path.

Despite the impressive efficiency gains following the oil crises in the 1970s and early 1980s, energy efficiency resources remain an impressive investment opportunity (McKinsey 2007,

[1] Economics for Equity and the Environment Network (E3) is a nationwide network of economists developing arguments for environmental protection with a social equity focus. For more information, please contact Kristen Sheeran, Director, at ksheeran@e3network.org. E3 is a program of Ecotrust.

Eldridge et al. 2007, Lovins 2006, Elliott et al. 2006, Shipley and Elliott 2006, Laitner 2006, and Laitner 2004).

A preliminary assessment by the American Council for an Energy-Efficient Economy (ACEEE) shows that Americans now invest about $200 billion in energy-efficient technologies each year. This compares to about $100 billion annually for on-going conventional energy infrastructure and $2 trillion in total investment for all purposes. While definitive estimates are premature, we scaled up our current research findings to project the impacts of accelerated market transformation through rapidly increased efficiency investment. Our findings about current investment levels assume a typical payback of about two years. In other words, in the absence of strong policy or other social incentive or motivation, businesses and consumers are unlikely to adopt a new technology unless it has roughly a 50 percent return on investment (i.e., the inverse of a two-year payback).

Assuming that policies, market forces, and new financing mechanisms facilitate substantial movement "up the cost curve" so that consumers and businesses are willing to accept longer-payback periods, we can posit a future in which businesses and consumers invest based on an average five-year payback. In that scenario, *annual investment in energy efficient technology would become a $400 billion market.* If the United States were to follow that course – and other ACEEE studies show this can be a cost-effective policy path – U.S. energy consumption in 2030 would not exceed the current forecast for 2013. And over the long haul, we could do better than that.

There are a large number of existing technologies that can be tapped to improve overall energy productivity. For instance, there are near-term and highly cost-effective upgrades that might improve the new car fuel economy from 27.5 miles per gallon today to 40 miles or more per gallon by 2030. When spread throughout the full fleet of existing light duty vehicles, this single measure might reduce total transportation fuels by 20 percent or more by 2030. These efficiency gains mean comparable reductions in air and water pollutants as well as in greenhouse gas emissions – all at a net savings to consumers, businesses, and the economy.

Additionally, there are productivity gains to be made in our nation's buildings and industries. Recent estimates by the Oak Ridge National Laboratory (ORNL) and the U.S. Environmental Protection Agency's (EPA) Energy Star program, for example, suggest that energy and greenhouse gas emissions can be reduced by 30 percent or more with existing technologies. The savings can be provided in a way that, on net, saves even more money. Yet another study by the Lawrence Berkeley National Laboratory (LBNL) indicates that the energy now wasted in our nation's industries and electric utilities could be converted into another source of supplemental heat and power for use elsewhere in the regional economy. In effect, the energy

we now waste in the mining, refining, and processing of fossil fuels, as well as in the generation of electricity, could become a source of both supplemental heat and electricity for use in our nation's industries and buildings. LBNL suggests that "waste-to-energy" technologies have the economic potential to meet as much as 20 percent of our nation's current electricity requirements.

While ACEEE's preliminary assessment indicates the efficiency market is already large, the more important question is how large the market can ultimately be, and how rapidly it can be developed. A new study organized by the United Nations Foundation, pulling on the expertise of some two dozen international energy experts, called energy efficiency both the largest and least expensive energy resource. The study suggested that the G-8 and other nations could double historical rates of efficiency improvement through at least 2030. In addition, a report by McKinsey Global Insight (2007) indicated that North America could meet all future growth in energy service demands through cost-effective efficiency investments. This means that the economy would grow at current forecasted rates but that energy demand growth would flatten out.

The most hopeful observation we take from this and other research is that because efficiency has been invisible to many investors, it may well be the sleeping giant of the clean technology spectrum. If we can craft the new financing approaches and policies needed to tap efficiency opportunities at a faster pace, we can create vibrant new markets as we make measurable progress on our energy and environmental challenges. We can also make efficiency one of the most effective resources in managing energy-related risks, as its diverse and dispersed nature cut across all areas of the economy. The core question that remains to be answered is: How do we further develop energy efficiency related investment mechanisms to capitalize on the full investment potential of the energy efficiency market? Participants in the E3 Network are invited to join with us in seeking answers.