



How America Can Build an Innovative New Energy System

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A hundred years ago, America's bright young men flocked to the high-tech industries of the day – among them electric power and oil and gas. These industries matured and gave the twentieth-century United States the great advantage of abundant and relatively inexpensive energy. But now the old energy system has reached its limits. It inflicts hardships on workers, communities and the environment, and entangles the nation in volatile situations overseas. Worst of all, scientists overwhelmingly agree that unless carbon-based patterns of energy production and use change, the world is headed toward climate-related disruptions on a devastating scale.

If humanity is to avoid this fate, nothing less than fundamental transformations of current patterns of energy production, delivery, and use are necessary. The challenge cannot be met merely by raising the price of fossil-fuels through a carbon tax or cap-and-trade scheme. The key solution lies in discovering and deploying cost-effective clean energy technologies that are better and cheaper than those now available. The energy transformation must be global in scope, yet the skills and resources of U.S. entrepreneurs, investors, producers, and energy users will be pivotal.

The U.S. Government Must Encourage Competitive Innovation

Innovation in energy technologies lags beyond the pace set, for example, in information technology. Today's energy companies and the financial institutions that fund them are risk-averse. Established players under-invest in research and development and start-up enterprises, in large part because they benefit when things *don't* change. Given existing industry structures and patterns of public regulation, market forces alone will not spur rapid technological change or take external costs from climate change or other environmental ills sufficiently into account.

New public initiatives are called for, but we need to be clear about the kinds of approaches that can help rather than make things worse. Today's energy system is too complicated and deeply enmeshed in all aspects of economic life for national authorities to monopolize the action – as they did in the 1940s Manhattan Project that created the atomic bomb. Rather, governments at all levels should rearrange incentives and patterns of interaction among businesses – as well as between business and government, within government, and between the energy industry and other sectors of the economy. New incentives and targeted resources can unlock the creativity of bright young women and men, the Edisons and Fords of the 21st century.

Why Electricity is Pivotal

Electricity generation and use are at the core of our energy system, but the relevant industries desperately need new firms, new people, and new ways of doing things – far beyond ongoing shifts. The recent shift from coal to natural gas in electricity generation has helped to reduce carbon emissions, but even if coal were to be displaced entirely by gas in electricity generation, dangerous emissions would drop by only about one-fifth. Yet the electric power sector needs to cut its emissions by at least 80% by mid-century, even as it meets the additional demands of a growing U.S. economy.

To get the electricity sector where it needs to go, state and federal regulations must change:

- To keep monopoly utilities from controlling the entire pathway from the power plant to homes and businesses, rules must be revised to encourage competition among power plants – in particular to spur them to experiment with innovative technologies.
- Regulators can also make a difference in how energy is used by promoting competition among companies that specialize in servicing energy installations and regulating demand. Rules should make it

profitable – and cost-saving – for businesses to make their use of energy more efficient and to shift toward cleaner sources.

- Utility companies will remain linchpins, but they should become “smart” orchestrators of diverse, innovative sources of affordable power and aim, overall, to reduce the use of energy sources that escalate carbon dioxide emissions. With the right regulatory incentives, smart integrator utility companies will emerge to buy low-cost, cleaner energy from innovative producers and foster many kinds of energy management services to consumers.

To Spur Innovation, Unlock Regional Diversity

Creative regulation to spur competition and the emergence of smart-integrator utilities will go a long way toward unlocking energy innovation, yet more needs to be done. Some fledgling low-carbon technologies need public support to help them become attractive enough for entrepreneurs, investors, and consumers to adopt on a large scale. But government should not channel support through one-size-fits-all national programs. Innovation is always uncertain, so it helps to try different things. In energy, diverse U.S. regions have very different resources, capabilities, and attitudes. The American Southwest is ideal for solar power; the Northeast is well situated for offshore wind electricity; and the Southeast welcomes nuclear energy.

Regions could become resourceful laboratories if neighboring states can cooperate through new kinds of institutions that we call Regional Innovation Investment Boards or Banks. Such entities would invest in the early deployment of new technologies created by innovators with some funding of their own – whether startups, well-established firms, or research laboratories. They could foster many experiments, so the nation as a whole can benefit from those that work best.

The bottom line is that America’s inherited energy system is too rigid. Big institutions, shackled by inflexible rules and outdated habits, control most of the resources. Our approach envisages a more flexible system, in which the many different players can seed and grow innovative solutions. Every tactic we have outlined has already worked in sectors ranging from information processing to biotech. In energy production and use, change will be slower, because the existing policies and incumbent firms are more deeply entrenched, and requirements for new entrants are very demanding. But America’s energy system undoubtedly can be greatly improved to become globally dynamic. With the stakes so high, it is important to start soon. There is no time to lose.

Read more in Richard K. Lester and David M. Hart, *Unlocking Energy Innovation: How America Can Build a Low-Cost, Low-Carbon Energy System* (MIT Press, 2012).