

frastructure. A few points deserve clarification.

Several electric ventures did, indeed, open in the US and the UK in the late 1870s and early 1880s before Thomas Edison's Pearl Street Station. However, we highlighted Edison since his was the first true utility "system" of substantial size, serving multiple functions and users.

The efficiency of the transmission system has increased over the years, largely through the use of higher-voltage AC transmission lines and, in a few selected situations, high-voltage DC transmission. Little has changed in transmission technology, though, except for a few applications of power electronics, and growth in demand continues to exceed the rate of capacity expansion.

The cost of electricity steadily declined in real terms from the birth of the industry to about 1970. Most of that cost reduction came from increases in power-plant size and efficiency—a trend that has slowed over the past 30 years and has been more than offset by fuel cost increases and the cost of retrofitting coal-fired power plants with environmental controls such as selective catalytic reduction and flue gas scrubbers.

The average fuel efficiency of central-station power does continue to increase, albeit slowly. The increase is mostly due to the recent addition of new plants, based on combustion turbine technology, that are only slightly more efficient than the average fleet of existing plants. Regrettably, the recent run-up in natural gas prices has rendered many of these plants uncompetitive. And so far, the costs of small generation devices such as fuel cells remain marginally competitive at best, despite their potential efficiency advantages, and they should be considered a complement to, not a replacement for, central-station generation.

The solution to our electric energy needs may include fuel cells—but realistically it will also require increasing the utilization efficiency of electricity and use of advanced nuclear reactors, cleaner combined-cycle coal combustion, and renewable energy resources.

Adapting hybrid vehicles to become plug-in hybrid vehicles is an exciting potential way to reduce overall energy needs even further, reduce emissions, and provide the lowest vehicle life-cycle costs to consumers. Several such vehicle configurations are being demonstrated in the US and Europe.

Today's power system remains the most complex machine ever invented by humankind. Adapting it to meet tomorrow's needs will require a portfolio of solutions and renewed investment. No matter how well-intended, efforts to promote individual solutions outside the context of a robust portfolio only distract and delay the essential comprehensive effort.

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Radioactive Sources May Enter US Illegally

I thought the article "Detecting Illicit Radioactive Sources" by Joseph McDonald, Bert Coursey, and Michael Carter (PHYSICS TODAY, November 2004, page 36) was a good presentation of current and future techniques for detecting radioactive material passing through legal ports of entry. However, passage through legal entry points is not the only pathway for illicit radioactive material to enter the US.

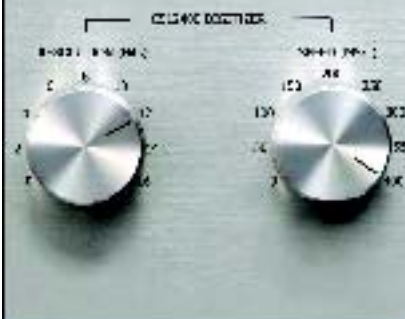
The US-Mexico border is almost 2000 miles (3200 km) long. Hundreds of thousands of illegal aliens cross that border into the US each year. It might be difficult to shield strong gamma emitters to the point where an individual could carry a significant quantity. However, the shielding or containment needed for beta or alpha emitters, including special nuclear materials, is light enough that a few individuals could safely carry enough material for a radioactive dispersal device or an improvised nuclear device.

Hundreds of metric tons of illegal drugs are smuggled into the US each year via land, sea, and air pathways. Larger quantities of illicit radioactive materials could enter the US by these routes.

I fully support the efforts to secure our legal ports of entry. They are a necessary part of our security. But I think this article may give a false sense of security by failing to mention these alternate entry pathways for illicit radioactive sources. Questions about the likelihood of terrorists using legal or illegal entry pathways, and about how illegal entry pathways could be patrolled need to be addressed.

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