Measured energy in Japan quake
Thorne Lay and Hiroo Kanamori

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of intellectual coherence, you had better reexamine what you wrongly may have thought you understood perfectly well about the nature of probability.

References

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Letters

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The article by Thorne Lay and Hiroo Kanamori titled “Insights from the great 2011 Japan earthquake” (PHYSICS TODAY, December 2011, page 33) is an interesting one. As a seismologist who worked in the field of underground nuclear explosions, I was caught by the following statement in the first paragraph: “Total strain energy equivalent to a 100-megaton explosion was released during the sliding.” Some familiarity with this subject led me to think this is not right. If the authors would carefully review their calculations using the energy equivalent in TNT, the relationship between seismic moment and magnitude, and the relationship between strain energy and seismic moment, they would find that the seismic energy equivalent of the 2011 Japan earthquake is roughly $2 \times 10^{17}$ J, while that of a 100-megaton nuclear bomb is roughly $4 \times 10^{17}$ J. Thus the 2011 Japan subduction event released approximately five times as much energy as a 100-megaton device, which is approximately twice the largest nuclear detonation ever—a 50-megaton atmospheric explosion by the former Soviet Union in October 1961.

The 1964 Chilean earthquake had still more energy by a factor of about 3, or 15 times that of a 100-megaton nuclear device. I believe the authors used the relation for seismic energy release rather than total strain energy release. The seismic energy underestimates the total strain energy release by a variable that depends on friction on the fault plane. Accounting for total strain energy release would increase the earthquake energy number by orders of magnitude.

Despite the catastrophic damage potential of nuclear bombs, the forces of nature occasionally unleash much larger energy releases. Although the nuclear bombs are under our control, earthquakes, volcanic eruptions, and extreme weather events are not. However, by judicious preparation and avoidance measures, humans can significantly diminish the damage of natural events.

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Private versus public energy solutions

Former Department of Energy official Steven Koonin expressed unwarranted confidence (PHYSICS TODAY, January 2012, page 19) that “energy needs to happen through the private sector. It owns, builds, operates essentially all the energy infrastructure in the country, and I don’t think we have any intention of changing that.”

I offer the following example to illustrate why I take issue with Koonin: During the night of 30 November–1 December 2011, residents of the West San Gabriel Valley, about 15 miles northeast of Los Angeles, experienced a severe Santa Ana windstorm that produced hurricane-force gusts. Thousands of trees were blown down, and power outages were widespread. The area is served by two utilities: Community-owned, not-for-profit Pasadena Water and Power (PWP), which provides electricity for the homes and businesses in Pasadena; and privately owned, for-profit Southern California Edison (SCE), which powers the surrounding communities.

Pasadena itself was probably the hardest hit, with about 1200 downed trees and nearly $30 million in damages. The wind speeds there during the event were at least as high as, and perhaps higher than, those in the surrounding communities. Nevertheless, only 10% of PWP customers lost power during the windstorm.

Meanwhile, Altadena, Arcadia, La Cañada Flintridge, and San Marino experienced total blackouts. In other nearby communities, such as Sierra Madre, South Pasadena, and Monrovia, at least 80% of homes and businesses lost power. In a front-page story in the Pasadena Star-News on 13 January 2012, SCE admitted that 75% of its customers in the area affected by the windstorm lost power.

In addition, while nearly all PWP customers had their power restored within 48 hours, many SCE customers had to wait much longer, some as long as a week.

The performance of SCE during and after the windstorm was so bad that it is now being investigated by the California Public Utilities Commission. Simply put, private-sector, for-profit SCE put in a dismal performance compared with the not-for-profit, community-owned PWP.

Perhaps Koonin needs to reconsider his belief that the private sector, with its focus on profits and stock dividends,