DOCKET
11-IEP-1J
DATE Jul 26 2011
RECD. Aug 02 2011

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Written/Oral testimony before the CEC, July 26, 2011

The CA Energy Commission (CEC) ran a workshop in Sacramento, CA on July 26.
The Workshop was to evaluate the state of nuclear technology in the wake of the Fukushima disaster, and collect public opinion about the future use of nuclear technology to provide electricity. I was a public interest witness, and submitted the following document for the workshop "Docket," and presented a 3 minute oral condensation of the material below:

Background: I was trained as a nuclear physicist, and have spent years working with radioactive materials at laboratories where reactors and nuclear accelerators were principal research tools. In recent years, I have followed the technical and societal issues resulting from the applications of this knowledge.

These issues have become much more urgent with the increasing evidence that human activities were significantly affecting the global climate. One of the major decisions has been whether using nuclear power to provide electricity would be a boon or a curse for society. My considered opinion is that nuclear power is indeed capable of providing electrical power for the future, with greatly reduced carbon dioxide production, but that this gain is more than counterbalanced by the many problems and enormous prospective liabilities of the large scale use of reactors.

I believe that reactor power now generated, or proposed for the future, could be supplied by a combination of solar photovoltaic, solar thermal, wind, and improved energy storage technologies, and some reductions in energy use from energy efficiency programs. All of these are now in large-scale use in the US, China, and other countries, and are being rapidly reduced in costs and installed in larger quantities.

My principal concerns about nuclear power come from what I think of as the “Faustian Bargains.(FBs)” This mythological term describes a seemingly generous contract with a Devil, which works well for some time, until years later, when the devil reappears and suddenly demands his due, which is buried in long forgotten fine print, and which requires devastating paybacks.

History, validated by recent events, provides many examples of severe penalties paid by society from seemingly minor violations of the perfection required for reactors to run successfully, for generations, without “unexpected events.” When large power reactors fail, the failures can easily be massive, exceeded only by major volcanic eruptions and nuclear bombs. People are not accustomed to disasters that reach far from the starting point, and may result in effectively permanent despoilation of large areas around the central damage point.

People are further freaked out by the invisibility of the contamination, the rapid global spread, and the impossibility of destroying the radioactivity, or recapturing it once it is loose in the environment. Because of the complexity of the problems, attempts to inform and explain to the populace seem mainly to destroy any faith they had in the government. (see below)

Now for the more specific FBs: High on the list at this point is the management/disposal of the highly radioactive spent fuel waste. In 1986, with “only” 65,000 tons of US reactor waste, the problem seemed simple, and Yucca Mountain was studied as a possible “permanent repository.” 25 years and $15Billion later, it has essentially been abandoned. The US now has no permanent storage arrangement for spent fuel.
(See recent Science article by R. Kerr, Vol. 333, p.150, July 8, 2011)

The next FB: When Fukushima “erupted,” a long dispute about reactor vulnerability to earthquakes and Tsunami became embarrassingly public. Most people know that Japan is seismically very active, and it

has been very heavily studied by some of the world's best seismologists. With so much of Japan's land along the Pacific and Sea of Japan coasts, major quakes not only shake the ground, they also create tsunamis, which often create more damage than the direct ground motion. These issues have been studied at length by the reactor designers, and supposedly, reactors are all certified as having adequate mechanical strength to withstand the "expected maximum" shaking, and corresponding tsunamis. Unfortunately, fault analysis and earthquake forecasting are not now refined enough to simulate the actual quakes that will occur. For both Diablo Canyon and Fukushima, new, significant faults were discovered directly beneath their foundations, after construction had begun. All four of the largest recent quakes in Japan were not anticipated. A recent article on this topic in Science (D. Normile, Vol. 131, March 18, 2011, p.1375), contained the following quotes by eminent Japanese and US seismologists:

"I never thought this kind of [event] could happen in this region."

"Major quakes always 'seem to be ones not expected.' "

"Quake's astonishing power and unexpected location also expose the futility of forecasting..."

"(Protective) berms proved no match for the towering tsunami waves."

"In view of the inevitable uncertainty, in my opinion it's better to have a more general approach" ([i.e., locating reactors in non-seismic regions.])

"And in CA, attention is focused on the San Andreas fault, even though the most damaging earthquakes of the past several decades occurred elsewhere."

The next FB: Failure to learn from the mistakes of the past: In 2007, another major quake of magnitude 6.6 damaged the Kashiwazakai-Kariwa nuclear plant, forcing a complete shutdown and rebuild that lasted 21 months. But so far as I can tell, no one ever did a "Lessons

Learned” and looked for similar vulnerabilities in the Fukushima plant. This event appears to have lost visibility; only Wikipedia had detailed reports.

The “Loss of Confidence” FB: I pointed out above that most citizens know very little about nuclear power, and even less about nuclear malfunctions. In the early stages of an “event,” a confusing stream of information comes from the government, reactor operators, news media, industry “experts,” etc. Most of these sources want to make the citizens feel comfortable and confident, and will bend the truth, or just ignore it, to emit positive messages. A remote cousin, who spent most of her life in central Japan, and is now raising a family, rediscovered me, remembered my nuclear physics roots, and first asked me for verification of material from Japanese TV programs and papers. Then she asked for information from US papers that would confirm or deny the Japanese press. Soon we traded 2 or more emails each day, in which I did try to be positive, but frequently had to deny advice offered by the government or by TEPCO, the operator. University scientists informing the government found that their information was being distorted or misused by the government, and soon sent the news to their own university web sites. Citizens quickly learned which sites had consistent information and forecasts which turned out to be correct. But they had lost confidence in the government in a broad and basic way, and it will takes years to regain this trust, if it ever happens. Science again has an excellent recent article on these problems, by D. Normile, in (Vol.332, 17 June 2011, p. 1368.)

The twin FBs of cost increases and construction delays: These are too well known in the reactor manufacturing world to require discussion here.

There are a number of other major FBs that represent enormous risk, such as damage to population and nearby areas, which could probably exceed hundreds of $Billions. It is, in any case, seen as so risky that no private insurer has taken on the opportunity; it’s only the US Citizen taxpayers who have unwillingly shouldered this responsibility.

I believe strongly that using nuclear reactors to provide general power

for our society exposes us to substantial risks, without commensurate benefits.

We would not be alone in declining the nuclear option. Germany has taken an early lead in sustainable energy technology, and since seeing the disaster of Fukushima, has chosen to use non-nuclear technology to provide power for our greener future.
Is it relevant that a physicist, Angela Merkel is the head of state?

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