

Interview

Waiting for the next Chernobyl

Earlier this year an Iranian nuclear scientist at the uranium conversion facility at Isfahan died from poisoning with uranium hexafluoride gas. Accidents like this keep **Najmedin Meshkati** awake at night. A leading expert in nuclear safety at the University of Southern California, the Iranian-born engineer worries that the Russian technology and human error that led to the Chernobyl disaster may cause a similar tragedy at Iran's nuclear facilities in Bushehr and elsewhere. The biggest nuclear threat from Iran is not from an attack but from an accident, he told **Deborah Campbell**, and international sanctions are only increasing the risk



How did you become involved in nuclear safety?

I was a graduate engineering student researching mathematical models for decision analysis. Then Three Mile Island happened on 28 March 1979. That changed my research direction and my life. The root cause of that accident was considered to be human error, and my dissertation project became measuring the mental workload of the operators of nuclear and other plants. My career, which has focused on the safety of complex technological systems such as nuclear power plants, was shaped by three accidents: Three Mile Island, the Bhopal chemical plant in 1984, and Chernobyl in 1986. These three catastrophic accidents all involved large-scale technological systems that contained hazardous materials, and all were caused by human and organisational failures.

You visited Chernobyl. What was it like?

Driving to the plant from Kiev, there is a checkpoint before you can enter the exclusion zone. It's a circle around the plant with a radius of 40 to 50 kilometres from which all the inhabitants have been evacuated. At the time of the accident about 7 million people lived in the surrounding area. I went to the city of Prip'yat where 100,000 employees and their families used to live. It's a ghost town now, right down to a deserted Ferris wheel.

Arriving at the reactor site, at the smoke stack and the sarcophagus they built around reactor 4 where the accident happened, hit me very hard. This accident caused a radioactive fire that burned for 10 days, releasing 190 tonnes of toxic materials into the atmosphere. There is no other human construction on this planet that has had as much impact, not only on the people living around it but on those downwind of the fallout and the generations born with birth defects.

What struck you about the control room?

I went to the control room of reactor 3, which is a few hundred metres from the doomed control room of reactor 4. I've been to many control rooms around the world, but the design of this one shocked me. It looked as

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if someone had thrown dials into a bag and tossed them against the wall. The haphazard nature of the arrangement and the height of the display of dials defied logic. You could barely see it. Valery Legasov, the physicist at the Soviet Academy of Sciences who investigated the meltdown for the Politburo, concluded that the primary cause of the accident was rooted in human factors: confusing control room design, inadequate operating procedures and the lack of a safety culture. He later committed suicide.

Throughout my career I have been trying to transfer the lessons from one industry to the next. All the factors that existed at Bhopal and Three Mile Island were present at Chernobyl. No one had learned from the previous accidents. Russian control room design and nuclear safety culture are still among the worst in the world.

You have sounded alarm bells about the current state of nuclear safety in Iran. What concerns you?

The fact that Iran is at the mercy of Russians. Because of sanctions, Iran has not been able to hire qualified western contractors to conduct safety analyses and quality control inspections. So the Russians are not only building the nuclear reactor at Bushehr, they are supervising themselves. The fox is in charge of the henhouse. For project oversight work Iran has to use companies staffed by former officials of the same ministry of nuclear energy that was in charge of Chernobyl. We have an expression in Persian that the knife doesn't cut its handle. Basically, people will not be critical of their colleagues.

Also, Iran cannot hold the Russian contractors to account. Through my personal contacts, I know that the Iranians have pushed the Russian contractors to adhere to the latest standards in the design, construction and operation of nuclear plants, but the Russians refused due to cost and lack of technical capability. The Iranians would lose face if the Russians pulled out, so they have to acquiesce.

Aren't sanctions necessary to prevent Iran from proceeding with its nuclear programme?

Sanctions on certain technologies may be necessary, but when it comes to safety, a nuclear accident anywhere is a nuclear accident everywhere. Chernobyl is exhibit A. The fallout travelled all over Europe and the

former Soviet Union. It is up to diplomats and others whether to give Iran nuclear fuel or a reactor but when it comes to quality control or the expertise to review control room design, this is benign technology that can only be used to ensure safety. It won't enable Iran to make a bomb. As Mohamed ElBaradei, director general of the International Atomic Energy Agency (IAEA), has said: “The first lesson that emerged from Chernobyl was the direct relevance of international cooperation to nuclear safety.”

How far would the fallout from a nuclear accident in Iran spread?

There would be a lot of contamination. If it happens in Bushehr, which is on the Persian Gulf, and the containment dome can't stop the fallout from travelling, the whole of Saudi Arabia, Kuwait, Dubai and the rest of the Gulf will be downwind. If it happens at one of the uranium enrichment plants, the local population centres will be at the mercy of the wind direction, as with the accident at Japan's enrichment plant in Tokaimura in 1999.

Where does the Nuclear Non-Proliferation Treaty stand on these issues?

Under the NPT every signatory [Iran included] is entitled to technical assistance from the IAEA. But on 9 February, under US pressure, the IAEA announced that it is ending 22 of 55 technical cooperation projects with Iran, several of them directly related to nuclear safety. The only place Iran can look to for independent safety review, knowledge and practices is the IAEA technical cooperation programme, and now it is prevented from doing that.

Some would argue that safety issues raise the stakes and we must try harder to stop Iran.

This is a double-edged sword. Being a signatory to the NPT gives countries the right to build nuclear power plants for peaceful civilian purposes. So stopping them is not legal or logical. If you want to stop Iran getting a nuclear bomb, do it through negotiation. But by preventing Iran from accessing safe nuclear technology you are potentially harming the whole planet.

How then should the international community respond to the crisis?

Nuclear safety must be decoupled from political considerations. Technology and know-how that relate to nuclear safety should never be made a pawn of political feuds. To paraphrase the French statesman Georges Clemenceau, nuclear safety is much too serious a matter to entrust to diplomats and politicians. ●

Profile

Najmedin Meshkati is a professor of civil/environmental engineering and industrial and systems engineering at the University of Southern California. His research, which is concerned with reducing risk and enhancing the reliability of complex, large-scale technological systems, has been drawn upon by nuclear power, aviation and petrochemical industries around the world.