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Where is God in Fukushima?

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Right there! Neither the rare and complex earthquake, nor the huge tsunami, nor the ailing nuclear power plant can displace God from his creation.

But let's start with that creation, which you will recall from Genesis chapter one, is presented as unequivocally good. And going back no further than age of this planet - perhaps 4500 million years, what do we have? Some tremendous changes, including continental drift, the tectonic movements such as moved Japan several metres east on 11 March and displaced over 125 cubic kilometres of water to create the tsunami, and volcanoes which spectacularly recycle the continental crust. These are all processes designed and built in to God's good creation. We also have floods, fires, tornadoes and droughts. We have to live with the whole lot rather than questioning God because of their occasional effects.

So God is there as creator, in the processes built into his creation.

This of course raises the question of where to build human settlements and infrastructure. We know of over 25,000 lives lost from the recent tsunami, and countless more people have lost homes. Vast infrastructure has been wiped away. There are dangerous aspects of God's creation. Tens of millions of Japanese live within about ten metres of sea level.

A relatively small bit of infrastructure affected by the quake and tsunami was Fukushima Daiichi nuclear power station, though it has hogged the media limelight. As all Japanese nuclear plants are designed to do, the three operating reactors shut down automatically due to the earthquake. While this was magnitude 9 - top level on the Richter scale, the ground acceleration at the plant was not huge - up to 550 Gal, or about half the acceleration of gravity. The automatic shutdown level set was only 135 Gal, and the plant was designed to withstand at least 438 Gal without damage, and was being modified to take 600 Gal, so the 550 Gal ground acceleration was not a big deal.

However, it was built right on the coast at about 10 metres above sea level. The water intakes etc were designed to survive a tsunami of 5.7 metres, this one was over 14 metres, and so there was about 5 metres of salt water through the turbine halls, with all their pumps and electrical switchgear.

When a nuclear plant shuts down automatically in an earthquake, that stops the fission process dead in its tracks, but you still need to remove a lot of heat due to the radioactive decay of the fission products in the fuel. At Fukushima the power was cut off by the quake so the back-up diesel generators started up to supply power to effect this cooling. But when the tsunami arrived an hour later, they were swamped, and the real problems started.

When the power failed the reactor cores would still be producing about 1.5% of their nominal thermal power, from fission product decay (about 22 MW in unit 1 and 33 MW in units 2 & 3). This would normally be removed as in the other eight reactors which shut down at the same time - via a residual heat removal system passing the water through an external heat exchanger, just like a motor car radiator. But there was not enough electricity for the pumps, and also the heat exchangers may have been damaged by the tsunami. The drama then unfolded, and continues still.

But just as living anywhere on the planet can expose us to risks from fires, floods, droughts, tsunamis, earthquakes, etc, so using our God-given abilities to create and use technology can expose us to further risks. Think of the road toll, and the fact that aeroplanes sometimes crash and ships sink, chemical plants go wrong, and even in the home, people are electrocuted - life <u>is</u> hazardous. But think of that list, how much fear is attached to each, for someone living from day to day through their lifetime?

At Fukushima we have a very serious nuclear reactor accident - in fact the most serious ever for western-designed reactors. Tell me, what's the death toll? How many people have received a harmful level of radiation exposure? (zero, zero)

So is God there restraining the harm of such a serious accident? Or is it just good fortune that nuclear reactor designers from the outset have been very conservative in building in safety barriers? Is God's sovereignty and grace in this matter something that has turned up in the last two months, or has it been ongoing since Ernest Rutherford opened up our understanding of the atom early last century, and James Chadwick discovered the neutron in 1932, and Lise Meitner and her nephew explained and quantified nuclear fission in 1939?

As you would know, after a diversion to produce atomic bombs in the 1940s, the focus returned to the other application for nuclear fission which had been identified by Frisch and Peierls, then by the British MAUD committee, in mid 1941 - the nuclear boiler. In the 1950s this started to open up the whole prospect of limitless clean energy from nuclear fission, and that prospect remains with us, stronger than ever. Today it is incredibly timely that the technology is proven and mature at a time when energy security concerns have never been greater - look at the US defence budget, mostly spent to enable US energy consumption! Also, a need to curtail CO2 emissions is a headline policy issue in most western countries.

So God is there as provider, with human science and its application in technology being an important expression of how we are created in God's image.

But it hasn't been plain sailing. Arising from what I called the diversion relating to atomic bombs, we had the Cold War. Probably no Australian understands the deep fear which was engendered in America and Europe through the 1950s and 1960s. This was very explicitly a fear of nuclear Armageddon, with vast destruction and deadly radiation never far away. It picked up on science fiction scenarios from much earlier and spawned all sorts of disarmament initiatives which soon became the driving force in opposing nuclear power for electricity, employing shameless fear mongering to conflate the very real Cold War fears with more contrived ones relating to nuclear power.

The nuclear industry has never entirely shaken off this stigma of fear, and the recent media coverage has inflamed it once again. Most of the media have tried to get the story straight, but that didn't stop headlines like "Nuclear reactor explodes" to describe a hydrogen explosion on the service floor of a reactor, or the incredibly irresponsible CNN coverage which had little regard either for facts or the effects of its hysterics and pseudo-experts.

So how do we understand fear? Fear gets a bit of coverage in the Bible, from fear of the consequences of disobedience of an apparently arbitrary command in Eden, to fear of confronting military odds rather than trusting God. There is also the 'fear of God' from Exodus and Deuteronomy on - engendering respect and humility on the part of God's people. The one thing that I cannot find anywhere is fear of anything or anyone being shown as a good reason not to proceed in line with God's leading and provision.

So God is there, understanding human fear.

So, sometimes deliberately, sometimes not, the media has done a lot to instil fear of radiation, and this has been reinforced by very conservative government actions such as moving people out of a large evacuation area around the Fukushima plant. Especially in Japan, the government fear is of not being seen to make enough fuss. Initially this evacuation was driven by concern that the plant might suddenly release a lot of radioactive material, but later on when it was clear that the reactors had settled down, it was largely excessive conservatism. Quite explicitly it was not because radiation doses in most of the area posed any problem. Thousands of people remain exiled from their homes for no very good reason.

Of course high levels of radiation exposure can be dangerous, but outside of the actual reactor buildings, and apart from a couple of days early on when there was lot of fallout on the plant site itself, there has been no danger to anyone beyond those few hundred workers on site whose exposure has been carefully monitored and controlled.

Why do many people fear ionizing radiation more than, say, road accidents? I guess the main reason is ignorance coupled with active misinformation, pointing to the vastly overstated possibility of cancer - radiation is a very weak carcinogen. If people talked about road accidents and airline accidents the way some do about radiation, they would be laughed down. But even doctors are relatively ignorant of radiation. Professor Zbigniew Jaworowski writing recently about responses to Chernobyl, and referring to a meeting in 1987 to discuss why so many people throughout Europe were given advice which compounded and exacerbated their irrational fears said that: "In none of the nine countries represented at the meeting were the principles of radiobiology and radiation protection included in medical school curricula. Lack of knowledge in this important group was among the factors that increased public anxiety and stress. It seems that now, two decades later, the situation in this respect is very much the same."

Certainly at Fukushima the release of radioactivity was unprecedented for a western nuclear plant, and reporting of this was predictably hyped and confused, with people even asking if it was safe to stay in Tokyo, over 100 km away! Hardly a single report related these levels of either radioactive contamination, or personal exposure, to what we are all subject to every day of our lives. So people freaked out at trivial reported levels while admiring their granite bench tops, going on skiing holidays and flying round the world - all of which would increase personal doses more.

Ionizing radiation is ubiquitous, we all have some radioactive potassium in our bones, our houses are radioactive, we are all breathing in radon all the time, and we pay good money for CT scans and other medical procedures which increase our radiation exposure even more. Yet all this adds up to very little, in other words it's not radiation but the amount of it that is relevant. Some people live in areas with twenty or more times the background radiation levels that all of us experience, yet without any ill effect or increase in cancer rate.

So maybe God is dropping the hint that we need to understand this aspect of his creation as well as we understand many others, which are benign or even beneficial in low doses but hazardous in high amounts. Replace fear with understanding. That's a big challenge!

However, as Ziggy Switowski put it: "the saturation media coverage of this nuclear crisis has taught Australians more about the nuclear fuel cycle, spent fuel storage and radioactivity in a week than we learned as a community in the past 30 years. With this understanding should come better informed judgments about the risk-reward trade-offs with all energy decisions." A similar benefit accrued worldwide, even though the nuclear industry took a massive hit to its public image.

Aircraft accidents are very valuable, we learn from them rather than abandoning air travel. The Qantas A380 engine disintegration in November means we will all be a lot safer. No lives were lost in that, and no lives have been lost from Fukushima. Perhaps we should be hoping for more such mishaps, not less. Certainly it is no good reason to stigmatise the technology itself, let alone consider ditching it.

But fundamentally, **God is at Fukushima in many respects** -
- as the power plant has provided reliable electricity for the Tokyo region of Japan for nearly 40 years,
- as several hundred staff now administer palliative care preparatory to the last rites to the stricken plant,
- as regulatory authorities and government supervise this,
- as the very much greater challenge of grappling with the aftermath of the tsunami - 25,000 deaths, countless people homeless, much infrastructure destroyed - is engaged,

- as Christians are apparently prominent in this relief effort, both among Tepco employees and outside the plant, and
- as plans are made to get the whole economy back on the rails.

These are all the good works which are congruent with God's kingdom inaugurated with Jesus' resurrection, and which anticipate God's restored creation in the fullness of time free from the distress and travail of the present age.

So, in considering our question of 'Where is God at Fukishima?' we need to be clear on the priority of implementing the creation mandate, which should mean using all the resources of intellect, technology, minerals and energy that God has given us for the benefit of almost seven billion people. Alternatively we may just sit back and allow that endeavour to be derailed by ignorant fears which have no decisive substance. Where is the biblical precedent for that?

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Follow-up questions:

- Are earthquakes and tsunamis really part of God's design, or do they result from the fall?
- Is science a fundamentally godly activity in understanding God's creation?
- How does technology - the product of humans made in God's image - express the nature of God?
- Should we expect God to prevent human casualties from natural disaster? from technological accidents?