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Green or black?

Is nuclear energy a safe choice? The experts have conflicting opinions.
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Safe, clean and abundant

Advocates of nuclear power say it is a solution to climate change and depleting fuel supplies.

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A crane control unit is seen at the closed loading station to Chamber 8a of the Asse nuclear waste disposal centre in a unused mine near the German village of Remlingen. – Reuters

NUCLEAR turns out to be five times safer than oil, 10 times safer than gas and 100 times safer than hydro-electric dams."

If this statement – published in a March 2005 *Reader's Digest* article titled "Our Nuclear Lifeline" – had been made by a nuclear industry insider, it could be dismissed as PR spiel.

But it came from James Lovelock, a prominent British environmentalist and author of *The Ages of Gaia*, who expounds the theory that Earth is a living organism that adjusts itself to make conditions comfortable for life.

As the world struggles to cap carbon dioxide emissions and greenhouse gases and deal with climate change, nuclear energy is becoming more and more appealing to even the environmentalists. Activists like Greenpeace co-founder Patrick Moore and Stewart Brand (editor of *The Whole Earth Catalogue*) share Lovelock's views.

In the past, environmentalists who decide to support nuclear energy get short shrift. The late Rev Hugh Montefiore was forced to resign from the board of Friends of the Earth (he was chairman from 1992 to 1998) when he began promoting nuclear energy as a means to fight global warming.

But things are changing, claims Bruno Comby, founder of Environmentalists for Nuclear Energy (EFN), which was set up in 1996, has branches around the world, and count Lovelock and Moore as members.

"Being anti-nuclear in the environmental movement is very old-fashioned now," Comby says in a phone interview from France.

The Earth is in peril and something has to be done. That's something pro- and anti-nuclear folks agree on.

Fanned by climate change and dwindling oil supplies, there's now a nuclear renaissance. More and more countries are beginning to consider having nuclear reactors; even Thailand, Vietnam, Indonesia and Malaysia have recently announced their nuclear plans.

Comby, 48, believes this is a good thing. "The world should embrace nuclear energy as soon as possible," he says.

Climate change is causing the sea waters to rise. This, in turn, affects world water and food supply. Worse still, oil is running out.

"We're burning huge amounts of gas, oil and coal which provide 85% of the world's energy today. If that energy disappears, civilisation as a whole will disappear," he says.

The only way for man to survive is to develop nuclear energy, fast, because it's the only form of energy that can replace fossil fuels adequately.

Comby considers himself a "fundamental environmentalist". He lives in an "eco house" in a Parisian suburb and has fought for the green cause for years. However, as a trained engineer, he finds many of the arguments against nuclear energy unfounded.

The burning of fossil fuels spews about 30bil tonnes of C02 into the athmosphere every year. That's about 800 tonnes of CO2 every second. In contrast, nuclear reactors produce almost no carbon dioxide, Comby says. (See Benefits of nuclear energy)

Detractors argue that the history of nuclear power development is rife with accidents, such as the Three Mile Island incident in the United States in 1979 and Chernobyl in1986. "The Chernobyl disaster was the result of Soviet (mis)organisation and mismanagement," says Berol Robinson, president of EFN's arm in the United States.

"Following orders from a distant authority, an experiment was conducted in haste, by inadequately trained personnel, on a badly designed reactor operating under known unsafe conditions," he claims.

Comby points out that when the Three Mile reactor melted partially, no lives were lost. In comparison, when a dam burst in Morvi, India, that same year, thousands of people were killed instantly.

The most dangerous energy comes from burning coal; explosions in coal mines can kill tens of thousands of people, he adds.

For Atomic Energy Licensing Board (AELB) director-general Raja Datuk Abdul Aziz Raja Adnan, three words are of paramount importance if Malaysia were to become a fully-fledged nuclear reliant nation.

"I believe in safety, security and safeguards," he says when met at the AELB headquarters in Dengkil, Selangor. The AELB is under the purview of the Science, Technology and Innovation Ministry.

"If Malaysia is going into nuclear development, we need an organisation like the AELB to regulate that and ensure the safety of our people and environment."

Abdul Aziz is also mindful of what's happening in neighbouring countries.

"Indonesia, Vietnam and Thailand are all planning to go nuclear between 2016 and 2021. We hope they will follow international norms. If our own government decides to pursue that, I will ensure that our nuclear power programme will not risk our people or our neighbours."

Abdul Aziz, who is one of 13 officials on the International Advisory Committee on Nuclear Security, feels that technology has moved far beyond the days of Chernobyl.

"Chernobly was during the Soviet era and the reactor manager had absolute say. There were no proper safety checks. They were performing experiments while providing power and there was no containment area.

"Nowadays nuclear plants operate differently. The technology has evolved such that if there was ever a meltdown, it would be contained. There will never be a meltdown because the reactors will stop before it occurs. That's why regulatory enforcement is so important," he says.

Abdul Aziz concedes that the disposal of radioactive waste is still a concern.

"In South Korea, which has had a nuclear programme for more than 30 years, the total amount of waste products is no bigger than the size of a room. New technology is being developed that burns the waste.

"Even the waste repositories, the latest being in Finland, are now designed to be

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Benefits of nuclear energy

"ONE of the nice things about nuclear power is that it emits practically no (well, very, very litle) carbon dioxide (CO2)," says Berol Robinson, president of the American branch of Environmentalist for Nuclear Energy (EFN).

A small quantity of CO2 is emitted in the "fuel cycle" – the mining of uranium, refining, fuel enrichment and fabrication, transportation, decommissioning, and waste disposal. But it's only a minor percentage of that emitted by burning fossil fuels such as coal, oil and gas, to obtain the same amount of energy.

CO2 is also emitted when a nuclear power plant is built as cement is made by burning a calcium-bearing mineral. "The absence of CO2 emissions from nuclear power stations is a strong reason to support nuclear power as it slows down the trend of global warming."

"There is no industry in the world in which more attention is paid to safety," Robinson adds. "The least violation of safety rules is investigated, evaluated and reported to the public but largely ignored by the media."

According to EFN founder Bruno Comby, if a nuclear reactor is well constructed and well designed, bad accidents will not happen even if it was poorly maintained. "Take Three Mile Island; mistakes were made, which lead to an accident. However, no one was hurt."

Unlike oil and gas deposits, which are likely be exhausted in the next few decades, uranium is abundant. Says Robinson: "With our present primitive nuclear technology, we use less than 1% of the energy in the uranium; the rest is now considered nuclear waste, which is stored away safely and permanently.

A copper-coated canister that weighs 25 tons and can contain two tons of spent nuclear fuel sits 450m below the ground at the site of a proposed nuclear waste repository in the southeastern Swedish town of Oskarshamn. – AFP

"In the near future we will build advanced power stations which can better use the energy locked up in uranium. Then uranium reserves will be automatically expanded 30 or 50 times, depending on the technology.

Furthermore, there's thorium, another nuclear fuel that is three or four times more abundant than uranium. It is used as a nuclear fuel in India.

Comby estimates that "1 gram of uranium produces the same energy as one tonne of oil". Besides, nuclear energy is already competitive with fossil fuel energy, Robinson says.

"The cost of nuclear fuel is only a small part of the price of a kiloWatt-hour and will remain so, while fuel is the major cost of fossil fuel energy and threatens to grow worse with the impending scarcity of gas and oil. People criticise the investment of public funds in nuclear, but fossil fuels enjoy comparable advantages."

He adds that renewable energy is not enough to power the industrial needs of modern civilisation today. If one were to reduce energy requirements via improved efficiency or other economies, growing demand will eventually overtake supply.

"Nuclear has been developed to an industrial level. It provides 20% of the electricity supply in the United States and 75% of that

'We are not afraid'

By ELIZABETH TAI

THIERRY Dehr, 49, lives 25km away from a nuclear reactor, but he is not very concerned about that.

"I think a lot more people die in road accidents than from nuclear side effects," the Frenchman, who was on holiday in Kuala Lumpur, said over the phone recently.

Dehr lives in Alsace in the eastern side of France with his Malaysian wife, Mei Yin. The nuclear reactor, called Fessenheim, is located along the Rhine river. There are villages around it – one is just 500m away from the reactor.

"The villagers are very fine about it. The land is very cheap as not many want to live there. The villagers have suffered no disease (caused by radiation) nor is there any leakage from the reactor," says the craftsman who owns a landscaping business.

France is touted as a nuclear energy success story for a very good reason: according to the World Nuclear Association, 75% of its electricity comes from nuclear energy and it has 59 nuclear reactors, which are operated by Electricite de France (EdF).

The country began to lean heavily on nuclear energy after 1974 when events in the Middle East caused a global "oil shock", which resulted in skyrocketing fuel prices. Back then, most of France's electricity came from oil-burning plants and because it had few natural energy resources – minimal coal and no oil or gas – it reeled from the shock.

Thus, French policy-makers decided that the country should capitalise on nuclear energy.

Last September, EdF bought Brtain's leading nuclear energy company, British Energy. Three months later, it announced that it would invest billions in the American Constellation Energy Nuclear Group.

Areva, the France government-controlled engineering company, is the world's biggest nuclear power plant construction company. The country has even offered to help build Malaysia's first nuclear power plant.

According to an article by American network Public Broadcasting Service's *Frontline* ("Nuclear Reaction: Why do Americans fear nuclear power?), the French are very accepting of nuclear energy. Dehr seems to be like most of his countrymen.

"We accept it as it's a good transition from gas, petrol and coal. Sooner or later we're going to run out of energy sources, which are also very polluting," he says.

His Malaysian wife, Mei Yin, shares his sentiments. "I feel comfortable living in an area surrounded by three nuclear reactors. I believe we should ask ourselves this: 'Should we deny ourselves the advantages provided by nuclear reactors just because we are afraid of the disadvantages that can come with it?" she says, via e-mail.

Cooling towers at French nuclear Tricastin site in southeastern France. The country is set to keep its oldest nuclear reactors running for another 10 years, buying time to build replacements. – Reuters

But aren't they afraid of a Chernobyl in their backyard?

"No nuclear disaster has ever happened in France so far, so I've never felt worried about it," Frédéric Bonardel, 33, a construction worker from Orléans says, via e-mail.

Dehr adds: "We all know and have seen the effect of a major catastrophe such as Chernobyl and Three Mile Island But there's not much choice. We go with it. (The danger of nuclear energy) is not something that's on our minds all the time."

He notes that because of its nuclear reactors, France is "self sufficient".

"We can even sell electricity to Britain and Germany. It's not as bad as people say – there are no after-effects (from the reactors)," he said. Dehr may not be aware of this: according to BBC reports, there were four leaks from French nuclear power stations last year. Around July last year, the French government had to ban fishing and water sports in two local rivers after liquid containing unenriched uranium leaked from a broken underground pipe into the ground and then the water.

Dehr says many French people believe they have to get rid of nuclear energy one day.

"The only bad point about nuclear energy is the waste. We've not found a way to manage it, so we bury it in old coal mines and sink it in cement. But we hope that in the next 1,000 years our children will find a way to get rid of that," he says.

According to *US News*, The French have been recycling their nuclear waste for about 25 years. The process was invented in the United States, but it was halted there because as the process separates uranium from plutonium, theoretically, it could be diverted to produce nuclearweapons.

Bornadel believes France should use "greener technologies" such as solar and wind energy but because of "obvious economical or political reasons", these haven't been sufficiently developed to be functional.

But for now, he thinks it's best that the older reactors are replaced by new ones. A new European pressurised water reactor, or EPR, will be built in Normandy soon. It consumes 15% less uranium and produces 30% less nuclear waste, says Usnews.com.

However, the waste it produces is "considerably more radioactive" than that from the older reactors.

Says Bornadel: "It's mandatory to find alternative solutions very quickly. But many international conglomerates, consortiums and influential groups are making huge profits from nuclear energy, and that won't make the task easy."

"In my opinion, there are as many French people who are for it as against it. I even believe that many among those who are against it are simply influenced, made fearful by what they read or hear in the news," says Mei Yin.

Dehr adds that there are strong anti-nuclear groups in France and it's healthy to have a counterbalance to the powerful nuclear lobbyists in the country.

He notes that Malaysia has a "huge amount of free energy", like solar energy, and should tap it.

"I think Malaysia will make a great leap if it concentrates on that instead of continuing to use petrol and choking the whole country with cars. I'm sitting here at KLCC talking to you, and the sun is out and it's really hot outside. And I'm thinking, 'What a waste.'"

> FROM SM4

Waste problem exaggerated

placed underground. In fact nuclear is the only power industry that looks after its waste," he says.

What about the increased incidence of cancer among those exposed to radiation, especially those who work at the plants?

"Daily, we live with natural background radiation. Nuclear power is like the sun, you can protect yourself from it through shielding, time and distance, but you can't get rid of it."

Robinson, for one, believes the nuclear waste problem has been grossly exaggerated.

"The volume of nuclear waste is a million times smaller than the volume of coal ash," he says. "Nuclear waste disappears spontaneously through radioactive decay while coal ash doesn't. There is no other waste product in this world which is totally confined like nuclear waste."

Another complaint by the anti-nuclear lobby concerns the decommissioning of power plants.

Abdul Aziz believes technology and procedures can ensure safe use. "Before we even apply for a nuclear power plant, the decommission plan must be in place. The commitment can be for more than 100 years!

"If, after 60 years, the reactor reaches its 'lifespan', we will stop it and let it cool down. After 40 years we will dismantle it because it is designed as a series of separate entities, and we will dispose of it. Decommission technology is evolving."

What about the possibility of terrorist strikes on projected nuclear sites?

Some parties are concerned that nuclear waste may lead to "nuclear proliferation". Could unscrupulous parties steal the enriched uranium fuel or the plutonium waste produced in the power reactor to produce nuclear weapons?

Says Robinson: "It is a fact that neither the enriched uranium fuel nor the plutonium waste is suitable for making a nuclear explosion." Besides, there's strict security at nuclear power stations.

According to Abdul Aziz, after the Sept 11 attacks, security was stepped up against such possible sabotage, on an international level.

"In Australia for example, a canopy of steel cables, much like what one would see at a large football stadium, was constructed over a recently constructed plant to deter possible attacks by air planes."

Anti-nuclear activists say renewable energy such as solar and wind power can meet society's needs and are viable alternatives to nuclear. But Comby and Robinson do not agree, while Lovelock dismisses the notion of renewables replacing nuclear energy as "romantic nonsense".

"Of course we have to go into energy conservation and some amount of renewables," says Comby. "But it will not solve the problem on a global scale nor will it enable the survival of our civilisation. It's not enough."

If one were to replace one nuclear reactor with windmills, one would have to align them from Genoa in Italy to all around the French Mediterranean coast, which is about 800km long, he says.

Furthermore, renewable energies are "very dilute", he says. "Huge surfaces are needed but they only produce moderate amounts, which are also intermittent. The energy is available only when the wind blows, and that doesn't happen all the time."

According to Abdul Aziz, Peninsula Malaysia may be energy-deficient by 2019. The country could turn to hydro energy, which can come from the Bakun Dam in Sarawak. But the energy has to be channelled via under-sea cables, which involves high security risks.

"You'd think that solar energy would be good, but we have a lot of cloud cover, which would makes the supply of solar energy irregular," he adds.

The fact remains that humanity needs huge amounts of energy to power industry, which in turn powers the transportation system and runs our computers, light the streets and enable us to grow food.

"Nuclear energy answers our need in a sound, clean and safe manner", Comby says.