NEWS & VIEWS

Managing High Level Nuclear Waste

The public perceives high-level nuclear waste management as an international dilemma.

Pronuclear groups blandly assure that there is no problem. Often they talk about toxic chemical wastes and wastes from other modes of power generation. This attitude tends to undermine their credibility.

"Analysis of the press shows that the tone of articles addressing the topic is at best neutral (simply factual), very often negative, or at least echoing the controversy that has been built up in recent years.

Positive elements are seldom to be found," Patrick Klein, Deputy Managing Director, Ipsos Opinion, an opinion research agency asserted.

Spent fuel

High level nuclear waste consists of spent fuel or highly radioactive residues left after reprocessing the extracting uranium and plutonium. Most of the radioactivity in spent fuel is due to fission products, which have relatively short half lives.

Their activity will reach background levels in a few thousand years. Isolation of activity from biosphere for a few thousand years is achievable. High level waste is made non-dispersible by vitrifying (incorporating them into glass, a material which is non-leachable for thousands of years) it. The public wrongly believes that vitrification process is storage in glass containers! India has developed the borosilicate technology.

If any waste leaches from glass, it has to penetrate several protective barriers such as a stainless steel container, a cladding of lead, a casing of titanium (a special corrosion-resistant alloy), several metres of backfill material such as clay or salt or granite before reaching the living environment. Each of these will last thousands of years.

Titanium in flowing saline water dissolves at a rate of 0.0013 mm per year. A six mm layer of titanium used to contain waste may last at least 4000 years (IAEA, 1981). Roman lead articles survived in the Mediterranean for 2000 years with little loss.

Lead casing of 10 cm, which may be used with waste, should last longer.

Archaeologists recovered over 875,000 nails from Inchtuthil in Scotland, where Romans hid 12 tonnes or iron nails in AD 86. Nails from the outer few centimetres are heavily corroded; many of those inside are almost intact after nearly two millennia.

Lifetime of massive steel

The lifetime of massive steel canisters perhaps 25 cm thick, in deep repositories may exceed 1000 years (New Scientist, 1990).

Copper from a bronze cannon recovered by archaeologists from a Swedish ship which sank in 1676 corroded at a rate of 40 gms per square metre in 300 years, equivalent to about a hundred-millionth of a metre per year.

A layer of copper, five centimetres thick used to isolate high level waste would take a million years to corrode (New Scientist, 1990). Copper migrates in clay at surprisingly low rates, only 4 cm in 300 years!

Backfill materials

Finally, waste containers will be placed in repositories made in seismically stable geological formations, with negligible ground water flow, a few hundred metres below ground.

Even if water enters, and corrodes the barriers the radio-nuclides will remain trapped in the backfill of a few hundred metres.

The commission of European Communities funded PAGIS (Performance Assessment of Geological Isolation Systems), which evaluated backfill materials such as clay, granite and salt.

Clay can retain radio-nuclides for hundreds of thousands of years. It has very low permeability. Its high plasticity reduces probability of formation of open faults. Salt has low porosity and permeability (ATOM, 1989). It has the property to seal faults. PAGIS studies showed that there would be no release of radioactivity placed in salt for millions of years.

Granite is inalterable, with high mechanical and chemical resistance. PAGIS studies indicated that no significant radio-activity is expected to reach man in less than one million years after disposal.

Geological disposal

The US National Academy of Sciences, the Office of Technology Assessment USA, the International Atomic Energy Agency, the Nuclear Energy Agency of the Organisation for

Economic Development and recently on April 27, 2006 the UK's Committee on Radioactive Waste Management (CoRWM) have concluded that the safest long term option to deal with high level radioactive waste is deep geological disposal.

Management of high level nuclear waste is a challenge to human ingenuity. But the issue is amenable to technological solution.

- K.S. Parthasarathy
Source : The Hindu, June 29, 2006

Kotli Bhel Hydroelectric Project to come up soon in North -Indian State Uttaranchal

The National Hydroelectric Power Corporation Ltd (NHPC) and Uttaranchal Government has signed an agreement for setting up the 195MW Kotli Bhel Hydroelectric Project (Stage 1a) on the river Bhagirathi in Ganga valley of north Indian state Uttaranchal.

The agreement includes provision on setting up of Stage 1B of the Kotli Bhel Hydroelectric Project on the Alaknanada, near Devprayag, and the 530MW Kotli Bhel Hydroelectric Project (Stage 2) on the Ganga at Kaudiala near Rishikesh.

Construction of these projects will be taken up almost simultaneously and together will generate a total of 4,235 million units. All the three projects are scheduled to be commissioned by 2012 during the 11th Five-Year Plan Period.

NHPC has already commissioned the 120MW Tanakpur power station at Banbassa in Champawat district and the 280MW Dhauliganga Power station at Dharchula in Pithoragarh district.

The state government had also entrusted NHPC with the implementation of the 630MW Garba Tawaghat, 240MW Chungar Chal and 55MW Karmoli Lumti Talli projects in Pithoragarh district of Uttaranchal state.

The detailed Project Report for the 420MW Lakhwar Vyasi project has also been submitted by NHPC to the Central Electric Authority and Union Ministry of Water Resources for clearance.

Source: The Times of India, June 10, 2006

Nilgiri Mountain Railway in the List of World Heritage

- First proposed in 1854, work on the Nilgiri Mountain Railway began in 1891 and was completed in 1908.

- It scales an elevation of 1069 ft to 7228 ft. The steepest mountain railway in India, its maximum gradient touches 1 in 12 – that is for every 12 ft the train travels, the altitude rises by 1 ft.
- Since the driver at the end of train can't see what lies ahead, each carriage has a small verandah on which a brakeman stands.
- Only railway in India to use the rack and pinion system though for only a part of the journey, from Kallar to Conoor.
- From Coonoor to Ooty, the train runs on diesel.
- Total length of route is 46 km with 208 curves, 16 tunnels and 250 bridges.

Source: Indian Express, December 4, 2005

Excerpts of the Lectures by Prof. Eleftheria and Prof. Karakostas

Prof. Papadimitriou Eleftheria, Aristotle University of Thessaloniki, Greece, talked on 23.1.2006 on application of the theory of Coulomb's criterion in fault-slip analysis of major earthquake in the Department of Earthquake Engineering, IIT, Roorkee. The contours of static stresses (due to the incremental shear stress minus incremental shear strength along an active shallow fault) may be used for locating safe zones for civil engineering construction. She suggested a smaller coefficient of friction of 0.4 only for calculating the incremental shear strength along an active fault at depth of 10 km.

Prof. Vassili Karakostas of the same University talked on 27.1.2006 on comparison of above theory with earthquakes. He showed that comparison is good, and the methodology is simple and practical. However, static incremental-stress distribution is found to change when new major earthquake occurs due to change in its fault-slip direction. The stress distribution is valid upto three times of length of fault. He talked on cyclicity of major earthquakes above 6 M in Greece for last 3 centuries. The period of cyclicity of earthquakes in Greece is about 55 years. There is period of only minor earthquakes in between two peaks. It is very interesting that one peak of earthquakes was missing completely in 19^{th} century. Then there was no major earthquake above 6 M for 117 years surprisingly. Further, there is a vast network of seismographs in the entire Greece. All buildings are designed as earthquake resistant and so loss of life is much smaller in Greece than elsewhere. Both the lectures were highly appreciated by the both seismologists and the civil engineers.

Source: Editors

Electric Bacteria

US researchers have found how some micro-organisms can clean groundwater and produce electricity from renewable resources. This, say the findings of a group of scientists at Massachusetts Amherst University, is thanks to Geobacter, which they found

in conductive and tiny structure called microbial nanowire. The nanowires are only 3-5 nanometres thick (20,000 time finer than a human hair), but durable and more than a thousand times as long as they are wide. The discovery could also influence applications in nanotechnology. The findings of the team, led by microbiologist Derek R Lovley, were published in Nature (June 23, Vol. 435, No. 7045). 'Such long, thin conductive structures are unprecedented in biology', says Lovley, who also discovered Geobacter in 1987. These microbes are found useful in the bioremediation of groundwater contaminated with toxic and radioactive metals or petroleum and can convert human and animal wastes or renewable biomass into electricity. Geobacter is an anaerobic bacteria (living without oxygen) that uses metals to gain energy the way humans and other organisms use oxygen. Early studies at Lovley's lab revealed that Geobacter produces fine, hairlike structures called the pili, on just one side of the cell. Lovley's team speculate that the pili are miniature wires extending from the cell that would enable Geobactor to carry out its unique ability to transfer electrons outside the cell onto metals and electrodes. This was confirmed in a study where microbiologist Gemma Ruegera teamed up with physicists Mark T.Tuominen and Kevin D McCarthy to probe the pili with the high resolution atomic force microscope. They found the pili were highly conductive. When Geobacter was genetically modified to prevent it from producing the pili, the bacteria could no longer transfer electrons.

Source: The Statesman, July 25, 2005

Give Thanks: It's Part of Spiritual Evolvement

God once sent two angels to earth to gather the prayers of humanity. The first angel was asked to collect all those prayers that were essentially requests from people asking God for something. The second angel was asked to collect all those prayers of thanks giving.

The two angels agreed to meet in a month with their collections. They began their task. The first angel collecting prayers that appealed to God for something that became extremely busy. Several baskets were needed to hold those prayers – asking for more money, better health, bigger house, car, computer, jewellery and clothing. Some prayed for spouse, for children, or for better relationships. There were so many such prayers that the angel had to obtain a van to cart them.

Meanwhile, the second angel travelled far and wide looking for prayers of thankfulness. Several days went by with hardly a prayer of gratitude heard. All that this angel heard prayers asking for things.

A month later the two angels returned to God. The angel collecting prayers for requests was laden with many baskets. The angel collecting prayers of thankfulness had only a few, a small amount compared to the prayers requesting things.

The story illustrates the human condition. Many of us request other to do things for us, but how many of us thank them? Similarly, we prayed to God for so many things that we want, but do we thank God? A similar situation is faced by parents and teachers. However, when there is a feedback of appreciation, it is heartwarming for parent or teacher, to receive thanks from their children or students for what they do for them feels good. It is not they ever cease to sacrifice and serve selflessly, but it's nice to know that the gift of love they give is acknowledged and appreciated.

We are fortunate to be born as humans. Only as humans do we have the faculty to know ourselves and to realize God. For this we should thank God every day of our lives. Once a man went to heaven and God told him he was lucky to have a human form. The man asked God, "Why are humans so special?" God first showed the man an insects, birds, lizards and other creatures. "Notice that they all have their heads turned down towards earth". Humans can look up. They are the only one that can lift their sights from the world to see God in the spiritual realms above. Human beings are blessed with a special faculty to gain spiritual knowledge. That opportunity is offered to every human being, but few make use of it. One needs to meditate to make full use of the gift.

By meditating daily we can achieve union with God and realize that we are the part of God. By meditation on the inner Light and sound of God, we can slowly achieve true happiness and fulfillment.

Let us thank God for the many gifts we have received- for our birth, health, food, clothing, and shelter and for our families. Let us also thank God for our education and for our jobs. However, let us not thank God merely with words but with deeds, by leading lives of non-violence, truthfulness, purity, humility and selfless service. Meditate daily so that we can connect with the inner Light and sound which means by which we can turn to our true nature.

- *Sant Rajinder Singh*
Source: The Times of India, June 2, 2006

God is the Creator and also the Creation

God for me is an omnipresent entity. He can take any form, therefore I see Him in all the people around me. My instinctive reaction is to love Him, in whichever form He appears. It is not possible to define exactly the nature of God since He is the Creator and also the Creation. Just like water's form cannot be defined, since if frozen, it becomes an ice cube, and if heated, it becomes vapour, so it is with God. He is all pervading consciousness.

People say that if there is God, why there is so much suffering? It is all because of our actions. God's grace is there for all to receive, but we must also be prepared to receive it. Just like a radio set cannot catch the programme that is being broadcast unless it is tuned

in to the right frequency, similarly we cannot benefit from God's grace unless our minds are attuned towards Him.

The question that arises now is how can we help remove the suffering that we see all around us? The answer is: by becoming more compassionate and seeking God's presence in everyone. If each one of us tries to become aware of others suffering and see it is has own, very soon, suffering itself will cease to exist.

However, the biggest problem today is that everybody wants to receive and nobody is ready to give. Even when people pray all they want is something in return. It is as if they are making a deal with God.

It is my dream to see the world with love and compassion, where everyone gets at least one square meal a day as well as clothing and shelter. Like a river keeps on flowing, I will continue to embrace my children and to see God's presence in them.

- Mata Amritanandamayi

Searching for Happiness? Hard Work may be Answer

You may think money in the bank, a great love life and professional success are the keys to be happy and fulfilled life. But scientists say the only path to real satisfaction and happiness is hard work. Academics at Gothenburg University in Sweden spent three years trying to discover what put a smile on peoples'faces.

They concluded that working hard to reach a goal often brings more self-satisfaction than the goal itself. Research leader Dr. Bengt Bruelde claims money, love and success bring only temporary joy. "You get used to it –then the happiness is over" he said.

"Striving to achieve something by work gives a purpose to life and this is the meaning of true happiness. Sitting in the sun with nothing to do is not a sure-fire recipe for a contended life". Dr. Bruelde, 46, admitted: "I know this may not sound very convincing when millions of people are just getting back to work after the Christmas and new year holidays".

"Of course rise or a holiday in the sun are pleasant experiences, but the problem is the "habituation effect" which usually occurs after a few weeks .You get used to the new situation and then the joy is over". He added: "To be happy is possible if one understands the mechanism which causes the feeling. Working hard to reach the goal is often a cause for more self -satisfaction and joy than actually reaching the winning post itself."

Dr. Bruelde, who is writing a book called *Pain and Happiness*, attacks the tourist industry for selling holidays as happiness. He said: "Tourist firms have made consumers believe that it is wonderful to sit in the sun, laze about and do nothing".

"But this is not a sure-fire recipe for being happy and anyway few people really enjoy their holiday as it's often not so perfect as they imagined."

Source: The Times of India, Jan 4, 2006

Lincoln-1: Abraham Lincoln's letter to his son's teacher

He will have to learn, I know,
that all men are not just,
all men are not true.
But teach him also that
for every scoundrel there is a hero;
that for every selfish politician,
there is a dedicated leader…..
Teach him for every enemy there is a friend.

Steer him away from envy,
if you can,
teach him the secret of
quiet laughter.

Let him learn early that
the bullies are the easiest to lick….
Teach him, if you can, the wonder of books…..
But also give him quiet time
to ponder the eternal mystery of birds in the sky,
bees in the sun,
and the flowers on a green hillside.

In the school teach him
it is far honourable to fail
than to cheat….
Teach him to have faith
in his own ideas,
even if everyone tells him
they are wrong….
Teach him to be gentle
with gentle people,
and tough with the tough.

Try to give my son
the strength not to follow the crowd
when everyone is getting on the band wagon…..

Teach him to listen to all men…..
but teach him also to filter
all he hears on a screen of truth,
and take only the good
that comes through.

Teach him if you can,
how to laugh when he is sad…..
Teach him there is no shame in tears,
Teach him to scoff at cynics
and to beware of too much sweetness….
Teach him to sell his brawn
and brain to the highest bidders
but never to put a price-tag
on his heart and soul.

Teach him to close his ears
to a howling mob
and to stand and fight
if he thinks he's right.
Treat him gently,
but do not cuddle him,
because only the test
of fire makes fine steel.

Let him have the courage
to be impatient…..
Let him have the patience to be brave.
Teach him always
to have sublime faith in himself,
because then he will have
sublime faith in mankind.

This is a big order,
but see what you can do…..
He is such a fine fellow,
my son!

Source : From Internet

Mona Lisa

As per the British weekly *New Scientist* reports Mona Lisa was 83 percent happy, nine percent disgusted, six percent fearful and two percent angry. That's the conclusion of a

University of Amsterdam computer that applied “emotion-recognition software” to Leonardo da Vinci’s work.

Source: The Hindustan Times

Humour - Equal Vision

A person brought a beautiful dog at home. Then he put his head down and feet up (shirsasan) in front of the lovely dog. His friend came and saw him upside down and asked him “Dear! what are you doing?”

He said “ I am trying to see the God in the dog.”