

Taka Hiraishi

29<sup>th</sup> March 2013

## Personal Assessment

This is a completely personal note, written largely for the purpose of brain storming!

Your shouts will be welcome! <taka\_hiraishi@nifty.com>

For a long time, I did not update this file. (I did an update on 1<sup>st</sup> August 2011.) My excuse is rather simple. I was devastated by my mistakes due to the lack of correct information. After the Fukushima nuclear accidents, I dilligently monitored information available through the Internet, including radioactivity monitoring resulsts, which was relatively accurate. In addition, I continued regular surfing of the websites based on which I undertook my assessment of risks. However, I was completely mistaken, or I would say, misled – for instance, through the websites, “measured” temperatures were regularly reported, and judging from them, I thought that the large part of nuclear fuel rods are kept under water. However, most of the measurement equipments, even the water level gauge, were not properly working, which was revealed only a long time after the accident.

Even after two years of time, the situation is fat from “under control”. Dismantling those four nuclear reactors will take decades of time. Final disposal of high level radioactive materials remains century-long question. I am only hoping that technolocal innovations and dedicated workers on site will find certain solutions.

And most importantly, there are thousands of people who had to move away from their home and had to find new life. My sympathies might not mean anything for them, and there is really nothing that I can do for them.

11<sup>th</sup> August 2011

I have been completely occupied with my work with the IPCC, more than half staying out of Japan, and losing up-to-date information on the Fukushima. I am trying to catch up . . .

### *Overall radiation*

Except those areas close to the site, environmental radiation readings are nearly back to normal, I think.

<http://www.mext.go.jp/english/incident/1303962.htm>

### *Containment at the site*

Thanks to the impressively dedicated and highly organised work, there have been steady advances on containment work. Facilities for the decontamination and re-circulation of water in the buildings and outside trenches are working fairly well (though with a few minor technical problems, of course), and external cooling systems for the spent fuel rods pool are being installed. However, the feeding of cooling water to the reactors #1, #2 and #3 still continues (at a gradually slower rate as the generated heat from fuel is getting smaller) – this continuously generates contaminated water (luckily it is now at less rate than that of the decontamination).

### *Residual radiation is a matter of serious concern*

On the other hand, radioactive fallouts, probably largely from mid-March emissions, persist and are causing a wide range of potential health risks, most notably through beef production and marketing. Somewhat mysteriously for me, risk of radioactive contamination of feeding hay was completely overlooked and consequently a few lots of beef that exceed current food radiation standards (500 Bqs/kg) leaked to the market. Naturally this caused nation-wide concerns among the consumers, which has forced the authorities to introduce complete monitoring of all the beef cattle – thus consumers will be protected, though at an enormous costs and time as well as the public feeling to reduce consumption of domestic beef. A serious lesson was learned – a small oversight can be very costly.

High radiation has been detected from debris (from earthquakes), removed top soil and plants, as well as waste water treatment sludge and waste incineration ash, and the volume of them is steadily increasing. The Ministry of the Environment has issued a guideline that those wastes that do not go beyond 9,000 Bqs/kg can be disposed of in regular “managed waste disposal sites”, and requested to store the other wastes safely. As the amount is getting larger, the treatment of the latter is getting a challenge for the region and the nation.

This image is a contour of recorded environmental radiation, shown at <http://kipuka.blog70.fc2.com/blog-entry-413.html>, which was based on the work of <http://www.nnistar.com/gmap/fukushima.html> (reflecting more than 26,000 measurement records since



March compiled by the Ministry of the Education and Science.). Please note that this image is a compilation of results of a wide range of different measurement schemes, and should not be used as a basis of any decision-making unless all the measurement parameters are individually considered.

I would not attempt to carry out a risk assessment based on this because I do not have any exposure data of reasonable quality, but I tend to believe that evacuation plans might need to be seriously re-considered, without paying any attention to the cost that might incur. Very detailed environmental measurements must be carried out and we should not shy away from strong actions to protect people's long-term health damages.

25th June 2011

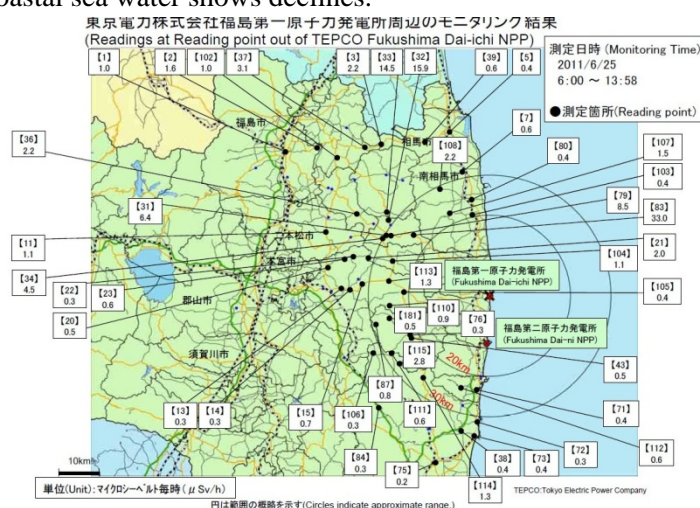
## Personal Assessment

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I have not been able to update this note because of difficulty of accessing the Internet while I was attending the UNFCCC meetings held in Bonn. (Needless to say that most of my attention has to be paid to the negotiation of future climate actions, even though the progress is extremely slow and frustrating .....

### Overall environmental radiation levels

Fortunately environmental radiation levels have been steadily lowering, which implies that there has been no additional major emission of radio-nuclides. However, some spots around the Fukushima reactors continue to show higher levels as shown below. The Government's general criteria contain 20 mSv/year for evacuation and unfortunately some areas show significant levels even 3 months after the mid-March major emissions. Contamination in the coastal sea water shows declines.



### Hot spots

As monitoring activities (both by Government agencies monitoring and private activities) advance there are few spots outside the stipulated evacuation areas where high level of environmental radiation has been recorded. The Government might need to address these areas.

### Schools

As I noted earlier, the Government has lowered the target levels, but public concerns and debates continue.

### Health monitoring

In Fukushima Prefecture a wide range of health monitoring has started, which would have to be continued for a long time span.

### *Food and water monitoring*

Monitoring of food and water continues and a few cases of detection above the “provisional standards” and the required market restriction has been applied. My personal assessment is, however, in view of the overall environmental radiation levels and this situation will not aggravate, though contamination of agricultural products from the nearby areas will continue a matter of concern.

### *Actions at the Fukushima Station*

Water purification and re-circulation work is steadily progressing. Addition of cooling water has to continue to the reactors and spent-fuel cooling pools as a must, and some 30-40 tonnes of water is added to them every day, especially to the reactor #3 of which temperature is still high (around 150 degrees C – I do not know why #3 has higher temperature?). The total amount of water thus accumulated in the tanks or underground structure so far has amounted to some 120,000 tonnes which is termed, “highly contaminated”, and it is increasing day by day (and the rain season is here in Japan). TEPCO has constructed a purification process – containing (i) oil removal, (ii) Caesium removal, (iii) overall nuclides removal, and (iv) desalinisation. The facility is still being tested, but they have reported reduction to the level of 10,000<sup>th</sup> (by (i) though (iii)) which contains only two digits of Bq per Kg (please remember that the drinking water standard is 200 Bq/water). Thus, they are close to the final stage to the using the purified water for cooling. One quantum step towards containment!

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2nd June 2011

## Personal Assessment

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### Environmental radiation levels

Environmental radiation levels have been steadily lowering. Though rainy season is here in Japan, radiation does not increase after rains – earlier we saw radiation peaks after rains.



This means that there have not been any major new emissions. However, higher radiation still persists in the areas near the nuclear site, especially in the North-west direction from the Fukushima #1 nuclear station. (The two circles show 20km and 30km radius.) High radiation levels in the North-west direction have been continuously observed since mid-March, probably due to the main

emission of radio-nuclides occurred on 15<sup>th</sup> March. This image also shows high levels of environmental radiation above the natural radiation level. (if you use my excel sheet, you can see that one microSv/hour means 8.76 miliSv/year, and we casually use the figure of 1 miliSv/year as natural background.)

### Containment actions at the site

TEPCO's fight against time still continues. While the reactor temperatures are relatively under control, they absolutely need to continue cooling of three reactors, and a total of some 20 tonnes of water per hour is added to them and leaked out. Thus, the high radiation level water is increasing every day, either in the ground rooms of the buildings or outdoor trenches. They are constructing a French company's water decontamination plant (scheduled to be complete around 15<sup>th</sup> June, but their water storage space for the high radiation water is getting shorter. TEPCO says the construction is on schedule, but they do not hide their concerns. (Rain season is here in Japan, and the roof of the three houses (#1, #3 and #4) were lost by the hydrogen explosions in March!)

### Food and water

Agricultural and fisheries products as well as water supply have been continuously monitored, and there have been a small number of detection, and required marketing restrictions have been enforced. Thus, I do not consider that there are imminent health risks for the public.

Nevertheless, consumers are concerned and sometimes results in reluctance from purchasing products from nearby regions.

### **Remnant radiation**

Cases of radiation measurements are increasing, in such areas as soil of schools and parks, agricultural soils, and sewage treatment sludge. Disposal of them is faced with difficulties, and this will continue for some time, I am afraid. (Some cases will get less serious (I hope) because they are the result of mid-March major emissions.)

### **Afterthoughts and political debates**

Often afterthoughts are useless, except they are remembered for the purpose of future use. Some notes follow.

#### *Firstly, my own:*

As you suspect, I have been regularly monitoring the reactor parameters from the TEPCO webpage and observing press conferences (by the Internet). Judging from the water level, temperature and internal pressure, I had thought that the damages of the reactors and containers were not extensive. For instance, TEPCO data showed that half of fuel rods had been covered by water (except a few instances). Only two weeks ago, they found that the water level indicators were not functioning. Thus, my assessments miserably collapsed. Although nothing is certain now, everybody believes that all the reactor cores have been extensively damaged, and fuel melt-down had occurred. One lesson: monitoring facilities should have backups.....

#### *Evacuation actions*

Government decisions on evacuation were obviously belated, and some were not science-based. At a rather early stage the Government (on 1<sup>st</sup> April – this was ridiculously late) used 20-30km zones as evacuation area (20 for evacuation and 30 for warning), and later they added the scheduled evacuation zone (announced in May!). I wonder why they made these decisions so late – radiation monitoring started in March! I do not understand either why they started with 20-30 when we all knew that the North-west areas showed higher radiation levels – we knew this in March.

More recently there are new debates on why the results of the SPEEDI (a computer simulation model of environmental diffusion) were not used before the mid-March emission. Though I personally tend to consider that this may be a typical afterthought, it was definitely regrettable that scientific information was not used wisely and in a timely manner in the decision making process at the top of the Government. Having said this, I should better add that the SPEEDI has obvious limitations. It can calculate eventual radiation levels based on the assumptions (most importantly, weather conditions (wind direction, temperature and precipitation) and amount of emitted radio-nuclides. It may provide useful predictions when steady emissions and stable weather conditions continue, but it would not give any early warnings. Clearly the latter was the case in mid-March major emission case. If you look into the SPEEDI calculations on 15<sup>th</sup> March, obviously they did not know how much of radio-nuclides were about to be emitted. To make it worse, the wind direction changed a lot on that day – wind direction literally rotated. Thus, I would call the new debate an afterthought.

However, however, I consider that Government's decisions on evacuation were belated and unscientific. Simply stated, the Government did not (and does not) have a proper decision-making process.



## Personal Assessment

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### Annual Radiation Level at School

The Minister for Education announced today, that they would aim at limiting the annual exposure at school to 1 mSv. Earlier target of 20 mSv/yr was seriously criticised. The announcement was accompanied by an explanation that the school kids' total annual exposure will be limited to 9 mSv. (I tend to believe that these figures do not contain natural radiation level – often 1 mSv/yr is mentioned as natural radiation.)

### Cooling Water Input on Day 2 (12<sup>th</sup> March)

“Interruption” of sea water feeding to the reactor #1 has been a subject of political dimension. An earlier announcement was that there was a 55 minutes interruption of sea water feeding, which was severely argued by the opposition parties at the National Diet. However it was revealed that the Director of the Fukushima Station unilaterally decided not to stop the sea water feeding in disagreement with the agreement at the TV conference involving representatives of the Government and senior staff of the TEPCO, where the Director himself was present. (The reasoning for the “interruption” was a perception of a possibility of re-criticality by adding sea water to the high temperature reactor core, but this is of course completely un-scientific perception in most experts' view. Continuation of cooling was a must.) The Director's unilateral decision must have been completely justifiable, but the misinformation (the Director reported the interruption in line with the agreement at the meeting, and then later reported resumption of seawater feeding after the “55 minutes of interruption”). to TEPCO has been criticised by the Government. This is considered that the front line people did not have much confidence in the central discussions. This itself is something of a cheap drama, which can be considered that the decision-making process at the top level seems to require more scientific grounds.

Fortunately in a sense, the further damage of reactor vessel could have been avoided by the Director's unilateral decision.

### Leakage of High Level Water from the Storage Facility

Somewhat hidden behind the above politicised story, there was a more serious news that the TEPCO found the leakage of high level water from the storage tank to the underground rooms of the Central Waste Management facility. Since this tank is collecting high level water from underground rooms of the reactor #1, #2 and #3, and of their turbine houses, as well as outdoor trenches, this leakage would cause difficulties in management (and re-circulation for cooling) of water.

### **Sporadic Detection of Radiation**

The Greenpeace announced their monitoring results of sea fish and plants. Scientific assessment might be required (on such as high level reading of short-life radio-nuclides, but this all implies that more extensive monitoring needs to be carried out. There have been some radiation measurement results (higher than the Government guidelines), and marketing has been stopped. Very personally speaking the tea leaf guideline value of 500 Bq/kg of tea leaf seems to be too strict (in comparison with 200 Bq/Kg of drinking water), but this also means that more extensive monitoring needs to be conducted.

### **Ambient Radiation Monitoring**

Broadly speaking ambient radiation levels continue lowering.

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Taka Hiraishi

25th May 2011

## **ICRP Recommendations**

The following are reference materials issued by the ICRP in the context of evaluation of long-term exposure limits.

- 2007 ICRP Recommendations (IARC Publication 103)  
[http://iopscience.iop.org/0952-4746/28/2/R02/pdf/0952-4746\\_28\\_2\\_R02.pdf](http://iopscience.iop.org/0952-4746/28/2/R02/pdf/0952-4746_28_2_R02.pdf)

You may consider that Page 165, Table 4 is very relevant.

- 2011 ICRP Publication 111 (Special Free Edition) on 2007 Recommendations  
[http://www.icrp.org/docs/P111\(Special%20Free%20Release\).pdf](http://www.icrp.org/docs/P111(Special%20Free%20Release).pdf)

You may find this section also informative.

- ANNEX A. HISTORICAL EXPERIENCE OF LONG-TERM CONTAMINATED AREAS

## Personal Assessment

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### “Melt-down” debate

Last week I wrote about “melt-down” of the reactor #1, but the Government authorities explained a few days later that it is likely that similar situation occurred also in the reactor #2 and #3. Miraculously again, “China Syndrome” did not happen. Immediately after the earthquake and tsunami, and subsequent total blackout of the station and consequent lowering of water which caused the fuel rods exposure above cooling water, the Government and TEPCO accepted significant damages to the fuel rods. However, “melt-down” possibility was not announced until last week. In discussing the situation, the definition of “melt-down” and “China Syndrome” may be required. According to the press conferences, “melt-down” is used by the Government authorities to mean that a large portion of fuel rods are melt, a large part of reactor core is destructed and contents of damaged fuel rods were dropped to the bottom of the reactor. The bottom of the reactor vessel might have been damaged and thus melt-down fuel might have leaked to the bottom of the container vessel. I consider that this definition is reasonable. I used “China Syndrome” meaning that the bottom of the container vessel is also damaged and melt fuel goes out of the container vessel.

These days there have been all sorts of discussions, including those at the National Diet on; when the melt-down occurred, why the cooling operation was interrupted, why this information was not shared till now, but I personally do not believe that this kind of discussions are very constructive. We should only thank God (see my notes of the last week), and focus on how the situation can be contained, and how similar accidents can be prevented in the other nuclear stations.

### Situation of the Fukushima plant

Cooling of reactors (#1, #2 and #3) has been relatively successful – by continued addition of cooling water. However, addition of water means the increase of high level contaminated water in the reactor building, turbine house, and surrounding trenches. Some 200 tonnes of water is added everyday, and high level contaminated water is being accumulated. TEPCO is constructing water purification and circulation system (differently from the normal system (reactor is being cooled through small circulation <from reactor-heat exchange-back to reactor>, this un-experienced system is intended to circulate water< from reactor-leakage to bottom of houses/trenches-storage tanks-purification facility-back to reactors>) with the French company technologies, but they are fighting against time – remaining space of temporary storage tanks is getting less and less, while purification and circulation plant is still being built.

## **Environmental radiation levels**

Although the leakage continues, the overall environmental radiation readings have been lowering, including those of sea water. However, radiation levels of highly contaminated areas continues in the nearby areas. TEPCO announced yesterday that they would assess the leakage of radio-nuclides to the surrounding environment. Quantitatively this may be small compared to the large emissions at the early stage, but if this can not be contained it could mean significant in a long term.

## **Food, water and fish**

Intensive monitoring is being carried out by the Government authorities, and a very limited range of products are banned from market. More serious impacts on markets are observed by “rumours”.

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Taka Hiraishi

15th May 2011

## Personal Assessment

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I have not added my notes for two weeks. This does not mean that the situation is satisfactorily stable, nor I have lost my interest. I have been away on mission to Abu Dhabi to attend IPCC meetings, where I did not have good access to the internet. Having said this:

### Environmental radiation levels

As far as I have been monitoring, environmental radiation levels have not shown any significant changes – overall environmental radiation levels have been declining, even though emissions have not been completely contained. Food and water levels have been continuously monitored by government agencies, and necessary control measures have been taken, and thus the consumers are not subject to any imminent risks because the food materials or drinking water supply are not available in the market or water supply system.

### Fukushima nuclear station (No.1 Station)

A few days ago, there was a new development in Unit 1, where the TEPCO found that the measurements of water level had been faulty. They have re-assessed the situation and announced that there was a complete exposure of fuel rods in the early stage after the earthquake and have accepted that there was significant melt down of fuel rods. (I have been regularly monitoring the reports at < <http://www.tepco.co.jp/nu/fukushima-np/index-j.html#anchor02>> and had had an impression that the Unit 1 had been rather stable, but their data now show that the measured water level is “down scale”. Apparently a large amount of melt fuel rods have dropped to the bottom of the reactor, and may have even escaped to the bottom of the container vessel. This is indeed a dreadful discovery but, awfully luckily “China Syndrome” did not happen, and overall temperature is now low and the situation is now rather stabilised. I am admittedly an atheist but I have to thank Gods. . .

They also found that a large of water has been leaked to the underground room, and they have to find a new containment actions to deal with it. (The exact amount of this water, presumably of an extremely high radiation level, is not known but the recent reports talks of some 2,000 tonnes. Thus they would need to install a decontamination facility and to circulate the water for cooling. Similar system had been discussed for Units 2 and 3, and thus they are now faced with a serious dilemma that while they have to continue cooling, by adding a large amount of water to the reactors, they have to construct a large decontamination scheme to recycle water for all the reactors, #1, #2 and #3. This development is not in a sense anything un-anticipated, because everybody knew that the cooling water added those reactors could not have

disappeared and must have been leaking to somewhere outside of the containment vessel. Now we know where the water is.

## **Hamaoka reactors**

Some 10 days ago, Prime Minister Kan announced that all the reactors at the Hamaoka nuclear power station should be stopped. It was a conditional stoppage (till complete anti-earthquake measures can be completed), but essentially, it meant that all those reactors will never be used again. This drastic action for the Hamaoka station is due to the recent discovery that the station is located near the geological fault, and these actions are exceptional ones only for the Hamaoka station. However this might mean that many nuclear power stations (which do not have such geological situation) will be subjected to very serious safety discussion for the future. . . . IPCC's recent report, Special Report on Renewable Energy Sources (SRREN) should be a significant resource in this context.

<<http://srren.ipcc-wg3.de/report/srren-spm-fd4>>

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### Environmental Radiation Levels

Fortunately, environmental radiation levels are generally declining, including the inside of the Fukushima Daiichi Nuclear Plant. This must mean that there has not been any new major release of nuclides. This does not mean, of course, no emissions. Three incidents of hydrogen explosion scattered radioactive debris especially inside the plant, and contaminated water inside has been increasing because of additions of cooling water to reactors #1, #2 and #3 and to fuel rods cooling pools for reactors #4, which all means potential increase of emissions.

Release of the SPEEDI results has given us some insights on the development of the accidents, but the data on the emissions are yet unclear. Recent information that there is a continuous release of radionuclides at the level of 157 teraBqs per day, but this would need to be confirmed later. This figure appears small (See my assessment dated 13 April) but the impacts are all depending on how long this level of emissions might continue.

### Containment Actions being taken

A really good news was that they have been able to see the bottom of the reactor #1, and no significant water leakage was observed. TEPCO is cautiously considering submerging the reactor to water within the container vessel, which would hopefully stabilise the temperature of the reactor. (Please note, however, addition of Nitrogen gas and water to the reactor does not result in the increase of pressure nor much increase of water level within the reactor. This would normally mean that there is a release of gases including water vapour.) TEPCO is carefully monitor the reactor temperature and pressure, by decreasing addition rate of water to the reactor #1.

Reactors #2 and #3 has leakages and addition of cooling water must be causing increase of high radiation water somewhere, either at the bottom (outside of the container vessel) or even seepage to the trenches. TEPCO is moving the high level water from trenches and underground rooms to a large containment tanks, but they would need to consider expanding those tanks.

It is clear that cooling of reactors and pools must continue to be the top priority, though the increase of high level water is an unavoidable consequences.

### Evacuation Actions and Consequences

The “scheduled” evacuation zones are being implemented, which causes major disruptions to the residents’ life and their activities. Provisional compensation payment has been



initiated. There have been a lot of discussions on the “20 mili-Sievert/year” criterion for the evacuation especially for the schools kids – some scientists argue that this level is too high and does not taken into account the internal radiation. Removal of top soil in two schools have been carried out though the final disposal of collected soil has caused arguments among the residents close to the disposal sites.

A large scale soil contamination measurement has started.

### **Contamination of Fish**

Measurements of fish (and sea water) have shown general declining of radiation, but there have been certain contamination detections, which led to marketing restrictions and intake advice of certain mushrooms, sand eels (the local fishery association stopped their fishing for the current season), and marsh grass from certain areas. These administrative actions (required for the purpose of health protection) has a limited negative impacts but more significant impacts on agricultural products via “unscientific rumours”.

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## Personal Assessment (25 April 2012)

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### Environmental Radiation levels in the vicinity

Having returned to Tokyo, I reviewed the press release of the radiation readings covered in the press releases of the Ministry of Education, Culture, Sports, Science & Technology, Japan (What a long name! Let me call them “MOES”). The summary of my work is already contained in the website. Unfortunately I was not able to find data for the area within 20 kms range, but the highly contaminated area is limited to the North-west direction (high radiation was observed between 20-30 km range). By the way, I have been informed that the radiation levels within 20 km are actually lower than those between 20-30 km range though the information did not contain time-series of data. Thus, my layman’s guess is that; (i) the contamination in those areas were caused by the high level emissions of mid-March, (ii) radio-nuclides fell in those limited span of areas by rain or snow, and that (iii) subsequent emissions have been relatively smaller. Thus, my optimistic views are, UNLESS there is further large scale emission (by, e.g, failure of reactor container(s)); (a) high level contamination zones will not expand, (b) radiation levels will decline in a long time span, (c) as environmental surveys advance, some evacuation areas might be de-listed.

<http://www.mext.go.jp/english/incident/1303962.htm>

### Radiation levels in the other areas

Environmental radiation levels are generally getting lower, even after recent rains. This supports my thoughts that the higher radiation readings were actually caused by the mid-March emission incidents.

### Marine sea water, drinking water, fish and agricultural products

There have been sporadic occurrences of radiation reports. Marketing of agricultural products from certain limited range of areas are controlled by Government’s measurements and regulations, and thus do not cause any public risks.

Sea water has been monitored, and higher (than natural) readings in the nearby coastal waters have been reported. This may need continuous monitoring.

Controls of marine fish do exist, though they are limited only to certain fish species. Wider monitoring and measurements in the fish species at higher food chain will need to be carefully carried out.

Impacts on agriculture and fisheries are significant – but I would say, more by rumours than actual radiation. The people have been faced with all the damages by the earthquakes and the tsunami. Coastal farmers lands have been inundated by sea water. Irrigation system were lost, let alone transports and market systems. Many fishing ports were seriously damaged, and majority of fishing boats gone. I would say that their additional economic loss by rumours is just unfair.

## **Overall**

Emergency containment works are still on-going on-site. Their cooling activities (which have to be continued at all costs) generates large amount of contaminated water that have to be stored and eventually managed. Risk of physical breaks of facilities is not negligible. Lots have to be done at the site – again I have to say that work has to be carried out at the workers' health risk.

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Taka Hiraishi

21<sup>st</sup> April 2011

## Personal Assessment (21 April 2012)

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### Radiation levels

Since higher level recorded in mid-March, overall radiation levels have been steadily going down, even in the vicinity of the nuclear plant site. This might mean that the major emissions of 15<sup>th</sup> and 16<sup>th</sup> March there has not been high level of emissions.

[http://www.mext.go.jp/component/english/\\_icsFiles/afieldfile/2011/04/21/1305097\\_042019.pdf](http://www.mext.go.jp/component/english/_icsFiles/afieldfile/2011/04/21/1305097_042019.pdf)

### Evacuation area categories have been upgraded.

On 21<sup>st</sup> April, the area within 20 km radius was declared as a “Warning Zone” under the Nuclear Safety Law. With this entry into the zone is now legally prohibited. This covers some 28,000 households, though limited visits will be organised.

### High level water leak

It was announced that in the leakage of high level water into the sea (which is now stopped) some  $4.7 \times 10^{15}$  Bq was leaked out to the sea from the hole. (Fortunately the amount itself was relatively small.)

### Overall containment actions

Reactor parameters are somewhat erroneous, and it is not easy to interpret.

<http://toofuya-en.blogspot.com/>

However, leakage appears continuing in the Reactors #1, #2 and #3, though environmental radiation levels have not been affected. A limited Visual images from Robots in the reactor houses are now available, and removal of high level water from turbine houses and outside trenches have been initiated. These activities can be considered significant progress in containment activities. A long term plans have been now announced (Step 1 (3 months) and Step 2 (6-9 months) but they are all contingent upon (i) the status of damages on the facilities and (ii) absence of any major incidents (steam explosion within the container vessels or re-criticality as a result of serious damages of fuel rods - Some experts consider that the detection of  $^{39}\text{Cl}$  in the environment might mean it.)

Taka Hiraishi

16<sup>th</sup> April 2011

## Personal Assessment (16 April 2012)

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Yesterday (15<sup>th</sup> April), Nuclear and Industrial Safety Agency (NISA) announced that the amount of radioactive substances contained in the low level radiation water released to the ocean – 150 giga Bq. This is not a negligible amount of course, but if compared with the amount of atmospheric emission (500,000 tera Bq – this triggered the change of INES Level 5 to 7) it is very small, which is a good news. This, however, does not mean the potential emission to the ocean would be small. Future emission to the sea is all contingent upon the on-going containment work.

### Reactor parameters

Generally there has not been any major changes, though there appear to be some faulty detectors.

<http://toofuya-en.blogspot.com/>

### Recent monitoring readings

Overall, monitoring readings show gradual decline.

[http://www.mext.go.jp/english/radioactivity\\_level/detail/1303986.htm](http://www.mext.go.jp/english/radioactivity_level/detail/1303986.htm)

### Containment work

The low level tanks are now emptied, but TEPCO is still inspecting these potential recipient storage facilities so that high level water can be safely moved from underground rooms and external trenches. This movement of high level water is a precondition for (i) inspecting of reactor facilities and (ii) any containment work thereafter.

### Recent news

14 April 2011

BBC

<http://www.bbc.co.uk/news/science-environment-13048916>

CNN

<http://edition.cnn.com/2011/WORLD/asiapcf/04/14/japan.nuclear.reactors/index.html?hpt=P1>

Taka Hiraishi

13<sup>th</sup> April 2011

## Personal Assessment (13 April 2012)

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When I was writing yesterday's assessment, I made one serious mistake. I was writing the figures while listening the press conferences and I mis-converted Japanese numbers and international numbers. I am sure many of the readers have noticed my mistake and inconsistency in my yesterday's text.

Correct figures of emissions:

Chernobyl emission: 5,200,000 tera Bq.

Fukushima: 370,000 tera Bq - 670,000 tera Bq

(i.e., in the range of 1/10 of Chernobyl as remarked by the Government.)

This means that in terms of emission amount, the Fukushima accident has emitted the amount that can be categorised as Level 7. I deeply regret my stupid mistake on this. However, I would insist on my impression that the Fukushima and Chernobyl accidents are really different. As the INES manual states, "Events are considered in terms of their impact on three different areas: impact on people and the environment; impact on radiological barriers and controls at facilities; and impact on defence in depth...", and thus the INES rating is not only based on emission amount. In view of the fact that nobody has been killed by the radiation, and in view of the low environmental radiation readings, the Fukushima situation is really different from the case of Chernobyl. Thus, I still feel that the new INES rating of Level 7 was rather misleading.

- - - - -

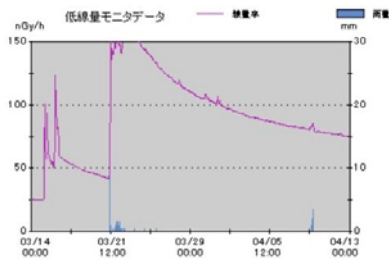
## Personal Assessment (13 April 2012)

This is a completely personal note, written largely for the purpose of brain storming!

Several hours ago, I wrote my personal assessments of 12<sup>th</sup> April. Due partly to the jet lag after 4 weeks international travel, but more caused by my irritation I did not sleep well. So, I decided to add one “sleep-writing” paragraph. I admit that this addition is something more emotional than factual or scientific.

### Levels:

The level 6 or 7 question bothered my sleep. I wrote of a “cautious” declaration of level 7 yesterday. Level 7 was chosen though the results of estimation of past emissions are some tens of thousands of tera Bq. My guess was that since the emissions are still on-going, somebody somewhere assumed in their assessment process that there would be sizable emissions in the future. On the other hand, the NISA spokesman stated in a press conference that if they can successfully continue containment activities they do not expect further major release of radioactive materials in the future. Even if the NISA statement may be based on their hopeful assumption, I feel that this assumption signifies their appreciation of the on-going containment work at the site, being carried out by the dedicated workers who are literally risking their life.



From the trend of environmental monitoring, there have been a few peaks in the past month probably reflecting major emissions caused by hydrogen explosions, facility burst(s) and precipitation (the latter peak occurred after the first heavy rainfall after the explosions). More recently, environmental radiation has been declining even after rainfalls. My way of thoughts tends to support NISA's assessment. Thinking of workers on site, I wonder why somebody assumed that there would be sizable environmental emissions in the future?

### New Evacuation policy

Yesterday, I wrote that the new policy is based on hitherto and anticipated annual radiation level. Reportedly, the boundary criteria was actually 20 mili Sievert in a year.

## Personal Assessment (12 April 2012)

This is a completely personal note, written largely for the purpose of brain storming!

There have been two major developments, namely changing the INES level to 7 (from earlier 5), and new evacuation policy. Other information is also added.

### INES Level change

As it has been broadly broadcasted, the Government of Japan decided, on 12<sup>th</sup> April 2011, to change the INES (International Nuclear and Radiological Event Scale) from 5 (“Limited release of radioactive material likely to require implementation of some planned countermeasures” and “Several deaths from radiation” to 7 (“Major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures”) as a “provisional assessment”. The Government also announced that the release amount of radioactive substances has been around 10% of that of the Chernobyl accident.

At the TEPCO press conference a spokesman said the assessment on the eventual total release exists, and agreed that if the remaining all radionuclides in the reactors (of some thousand tera Bq) are released, the total emission might be similar or larger than the one of the Chernobyl.

According to press conferences, the amount of release was estimated some 37,000 tera Bq and 67,000 tera Bq (two different estimations using different methodologies by two institutions. Cf: Estimation of Chernobyl emission is some 5,200 thousand Bq.)

My immediate very personal impression is this declaration is a very cautious one. If you read the INES manual, shown below, and in view of the absence of any death incidents caused by radiation, the level could be rather close to that of level 6, very objectively speaking, but I guess that this decision took into account the fact that the leakage is still ongoing in the Fukushima case. (Actually, the Nuclear and Industrial Safety Agency (NISA) stated that if they can successfully continue containment activities they do not expect further major release of radioactive materials in the future – this is of course their hopeful expectation. The important point is that these are all contingent upon the on-going and future containment activities.

INES Manual page 17. <[http://www-pub.iaea.org/MTCD/publications/PDF/INES-2009\\_web.pdf](http://www-pub.iaea.org/MTCD/publications/PDF/INES-2009_web.pdf)>



#### Level 7:

*“An event resulting in an environmental release corresponding to a quantity of radioactivity radiologically equivalent to a release to the atmosphere of more than several tens of thousands of terabecquerels of <sup>131</sup>I.”*

This corresponds to a large fraction of the core inventory of a power reactor, typically involving a mixture of short and long lived radionuclides. With such a release, stochastic health effects over a wide area, perhaps involving more than one country, are expected, and there is a possibility of deterministic health effects. Long-term environmental consequences are also likely, and it is very likely that protective action such as sheltering and evacuation will be judged necessary to prevent or limit health effects on members of the public.

#### Level 6

*“An event resulting in an environmental release corresponding to a quantity of radioactivity radiologically equivalent to a release to the atmosphere of the order of thousands to tens of thousands of terabecquerels of <sup>131</sup>I.”*

With such a release, it is very likely that protective action such as sheltering and evacuation will be judged necessary to prevent or limit health effects on members of the public.

### **Expansion of evacuation policy**

Yesterday, the Government announced its new evacuation policy. This policy now covers evacuation areas based on hitherto and anticipated annual radiation level rather than mechanistic identification of areas (e.g., 20 km or 30 km radius). My personal guess is that this has become possible by accumulated radiation monitoring results and model dispersion model studies, such as the “SPEEDI”. Some areas (within 30 km radius) was not included in the new target areas, but some villages (administrative government areas) have been added, as “Scheduled Evacuation Plan Areas” from which “the residents were advised to move out in one month time.” Naturally, this new policy has stirred bad feelings among many residents concerned.

### **Environmental monitoring readings**

There have been some rain in the Kanto areas, but fortunately there has been no increase of radiation levels in the environment nor in waters.

### **Containment actions**

Addition of cooling water contains in reactors #2 and #3, and nitrogen gas input (for the purpose of avoiding any hydrogen explosion) to the container of the reactor #1. (Obviously this all means that there is some leakage from these reactors.)

Conditions of the fuel rods cooling pools are stable (by addition of water).

There have been rather large aftershocks and the activities were interrupted, but have been resumed.

Management of contaminated water is slowly on-going, but high level radiation water still hinders the inspection of reactors (reactor houses), turbine houses, and surrounding trenches.

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## Personal Assessment (10 April 2011)

This is a completely personal note, written largely for the purpose of brain storming!

Having returned back home after 4 weeks of international travels (four meetings in four countries), the following are my second notes mainly on the nuclear accident.

1. Environmental monitoring readings and environmental safety
  - Status remain the same – except the nearby localities radiation levels do not indicate any immediate health risks.  
< [http://www.mext.go.jp/english/radioactivity\\_level/detail/1303986.htm](http://www.mext.go.jp/english/radioactivity_level/detail/1303986.htm)>
  - Certain areas close to the Fukushima Nuclear Station No. 1, however, shows higher radiation levels that needs attention. Some additional local actions may need urgent actions, including health protection actions for local people. (Currently, evacuation for 20 km radius region, and “stay in house” for 30 km radius region are implemented, but widening these areas need to be considered, in my personal view.)  
<[http://www.mext.go.jp/component/english/\\_icsFiles/afieldfile/2011/04/10/1304690\\_0919.pdf](http://www.mext.go.jp/component/english/_icsFiles/afieldfile/2011/04/10/1304690_0919.pdf)>
  - Radiation from tap water seems to be safe.
  - Radiation from agricultural and fisheries products have been detected and a number of administrative actions have been taken:
    - Regulation on marketing of agricultural products from certain areas:  
[http://www.kantei.go.jp/saigai/20110408shiji\\_fukushima.pdf](http://www.kantei.go.jp/saigai/20110408shiji_fukushima.pdf),  
[http://www.kantei.go.jp/saigai/20110323shiji\\_ibaraki.pdf](http://www.kantei.go.jp/saigai/20110323shiji_ibaraki.pdf),  
[http://www.maff.go.jp/noutiku\\_eikyo/index.html](http://www.maff.go.jp/noutiku_eikyo/index.html)
  - Regulatory actions on fishery products have been very limited, but after the release of low-level water (see below), market’s reactions have been significant. In addition to the destruction of ports and fishing boats, fishing industry in the wide area is faced with major negative market reaction, and largely is inactive.
2. Containment work and safety measures
  - Reactors are broadly under emergency management, though (i) the reactor #1 is yet unstable, (ii) reactors #2 and #3 appear leaking (due to the high radiation the exact status is not yet clarified), and (iii) fuel rod cooling pools for reactors #4, #5 and #6 needs continuous external cooling.

- Original cooling systems are yet to be re-constructed, though external electricity supply has been recovered.
  - Treatment of high level radiation water (of different sources) is the central task right now, and the ocean disposal of very low level water has been carried out to obtain storage capacity of high level water. (Without this, access to the areas near to the reactors will not be feasible.) As I wrote earlier, radiation of the released water (of some 11,500 tonnes) is low (somewhat comparable with drinking water standards or some natural hot spa water), but this release caused a wide range of international criticisms largely because of the sudden decision and absence of international notification.) (As you might notice, I personally appreciate, in view of the relatively small size of emission of radioactive substances, the need of this decision so that a larger subsequent emission of radio-nuclides can be avoided, but this is a matter of judgement.)
  - In a medium term, containment actions of several more months will be important which will determine the future of the concerned areas, of decades.
3. Overall impacts (including the impacts of the earthquakes)
- Having returned to Japan and viewing mass media in Japan, the seriousness of impacts is enormous, starting with yet-unknown human loss, loss of areas (daily life, culture, etc. etc), industries (which have major economic impacts on Japanese industries, agriculture, fisheries, ....
  - Goodwill extended from all sides, of all nature, is widely reported and appreciated.
4. Afterthoughts
- As always, we see a lots of afterthoughts. Some are only trying to make excuses and completely un-constructive, but I am hoping for the better, drawn from this extremely unfortunate accidents. Better safety standards, and no repetition of this situation.
5. Future tasks
- Again, I believe that it is very premature to discuss the details of the future. Containment is yet to be elaborated and implemented, and a long-term reconstruction has to be started.

I thank you for your attention.

Taka HIRAISHI

Taka Hiraishi

5<sup>th</sup> April 2011

**This is a completely personal note, written largely for the purpose of brain storming!**

Dear Friends,

This is an extremely, extraordinarily special issue. I am sending this mail to all my "Underground" mail friends this time, but I would send similar subsequent mail only to those friends who wish to be involved in the information exchange for the future.

The main reason for sending this mail to you is to share some updated information and my personal assessment on the situation. I have seen many international press articles, which I consider unbalanced or misleading. Some talk of "domino melt-down", others talk of "leak of molten fuel through the bottom of nuclear reactor and container", "diffusing high level radiation water to the open sea", so on and on. Such articles are, among many others:

<http://www.guardian.co.uk/world/2011/mar/29/japan-lost-race-save-nuclear-reactor>

<http://english.aljazeera.net/indepth/features/2011/04/20114219250664111.html>

This might be partly due to the absence of good information from the Japanese authorities and the TEPCO. However, it may be unfair to criticise the Japanese side only because simply they might not have good information themselves. Actually, TEPCO Press conference on U-stream is an extremely useful, but it is in Japanese only.

<http://www.ustream.tv/channel/iwakamiyasumi>

Making this long mail even longer, let me make a personal confession. I am on my four week mission, covering four countries and four meetings. I left Japan on 17th March, but I did think of throwing away all of responsibilities (of the IPCC, and the others) so as to stay on with my family. However, I concluded that the situation would not go to the worst, and fortunately I was right. Thus, I am here in Bangkok, hoping that my conclusion of three weeks ago continues to be valid for the future.

So, all started on that Friday afternoon, 11<sup>th</sup> March, with the largest-ever recorded earthquake(s) in Japan and historically not-well-known huge Tsunamis. Thanks to the Japanese TV system, lots were televised live. Watching them, I wrote an email to my friends that it is not a wave. The sea is moving over land, carrying cars, houses, ships, people and all sorts of debris. We are now talking of close to 30,000 deaths. Many towns and villages vanished with their people, culture and all those people had cherished. It would take decades, I feel, that we can calmly talk of those calamities.

Here, I wish to make a step aside from all these calamities and talk of nuclear reactors. First simplest summary is that the earthquakes scrambled all those nuclear stations in the region (together with the other thermal power stations) - meaning loss of more than 10 GW/hour power generation capability at once.

Among the nuclear reactors affected, there are six nuclear reactors at the Fukushima power station No.1. Three of those reactors were in the process of regular inspection but the other 3, #1, #2 and #3 were in operation and scrambled down (safely). However it seems that their system, including the core cooling facilities, did not activate themselves, because there were seriously damaged or lost (some because of loss of external power supply, loss of subsidiary power generation facilities (some engines or even fuel tanks were washed away by Tsunamis. These six reactors have six different stories afterwards. Since I am not completely informed of the details of the situation, I would limit myself to talking of a few specific issues rather than those six individual reactors from now on.

1. Environmental monitoring reading and regional impacts.

- There are a number of website showing results of radiation monitoring, such as [http://www.mext.go.jp/english/radioactivity\\_level/detail/1303986.htm](http://www.mext.go.jp/english/radioactivity_level/detail/1303986.htm). This site carries also radiation level of tap water. Monitoring results of many points inside the power stations are also available.
- There were a few sharp peaks after the hydrogen explosions and subsequent rainfalls, but since then environmental radiation levels have been slowly going down.
- With the exception of few spots near the nuclear station No.1, most of monitoring spots do not show the radiation level of immediate environmental hazards. (There may be differing views, but I usually consider those readings below 1 micro Sievert /hour something close to the range of natural background radiation.). If you apply my standards (only tentatively), there are several locations (in the vicinity of the nuclear reactors), where long term health attention might be required.
- Overall, except those spots within the nuclear facilities, no immediate acute danger from direct environmental radiation has been perceived. However, there have been a few instances of water contamination warning (vis-à-vis I-131 drinking water standards of 300 Bq/kg (water) and 100 Bq/kg (of water) for less than one year old babies.), and contamination warnings and market regulations on several kind of vegetables from neighbouring areas.  
<[http://www.kantei.go.jp/saigai/genpatsu\\_houshanou.html#shokuhin](http://www.kantei.go.jp/saigai/genpatsu_houshanou.html#shokuhin)>
- In this context, I have seen several cases of “safety statement”, saying radiation of chest X ray is some 0.05 mili Sievert (per shot), and environmental radiation (of, for instance, 10 micro Sievert/hour) is safe – but this is of course illogical. One year is some 8, 760 hours!
- We can not deny at all the serious impacts on the region. Many people have been evacuated, and I personally believe that more evacuation is recommendable, especially young children and ladies. Results of Japan’s computer model research, “SPEEDI” has been publicised. < [http://www.nsc.go.jp/info/110323\\_top\\_siryu.pdf](http://www.nsc.go.jp/info/110323_top_siryu.pdf)> There are similar research, such as < <http://www.newscientist.com/article/dn20285->

[fukushima-radioactive-fallout-nears-chernobyl-levels.html](http://www.fukushima-radioactive-fallout-nears-chernobyl-levels.html)>. As far as I understand, these research require many assumptions and I tend to consider that they are yet somewhat indicative rather than quantitative. Because of extremely high sensitivity, CTBT network's "detection" may not mean much unless we know of the quantity of radiation. However, I believe that the Japanese SPEEDI can be useful as a guide of administrative preventive actions.

## 2. Core melt-down risk

- It is well known, that removal of decay heat is absolutely required. – For decay heat, "7% of thermal outputs from the reactor" (immediately after scum) is used. (Please note that "1GW" power station has 3 GW thermal outputs). Unless this heat is removed, fuel rods will get damaged (melting point below 1,000 degrees C) and contents will be dispersed to cooling (reactor) water, fuel rods cover material (zirconium alloy) will react with water and form hydrogen gas (three hydrogen explosions occurred consecutively in #1, #2 and #4 turbine houses), and finally fuel pellets contained in the rods will melt (>2,800 degrees C) – this is so-called melt-down.
- Thus the cooling of the nuclear core is the first priority MUST. There were certain times when the reactor water level went all the way down to expose fuel rods in reactor #2, became dry. Because of the insufficient availability of freshwater, they used sea water for this purpose, which was later substituted by freshwater. To some reactors, Boron was added to avoid any re-criticality.
- Continuing the addition of cooling water and maintaining inside pressure was a challenge for #1 and #2, but while this process was ongoing, the internal (gauge) pressure of suppression chamber of #2 fell to near zero (this means that leakage occurred). Later, internal gauge pressure of #2 and #3 reactors became near zero, and this means that these reactors have some leakage.
- METI is rather transparent on this and we can see the "parameters" of all six reactors. It is in Japanese, but I guess you can understand this – for instance the inside temperatures are relatively low, and risk of steam explosion seems to be low. From today (7<sup>th</sup> April, they started adding Nitrogen gas to the #3 container to avoid any hydrogen explosion.)

<http://www.nisa.meti.go.jp/earthquake/plant.pdf>

## 3. Keeping Cooling pool cool.

- Fuel rods pools are usually cool with cooling facility, but after cooling facility has been lost, temperature rise (and water loss by vaporisation) became problematic for reactors #4, #5 and #6. Addition of water by helicopter, by fire engine, and more recently by concrete injection machines have been undertaken, but addition of water in such manners might have increased the amount of contaminated water. Though original cooling facility has not been recovered, further loss of water and eventual hydrogen explosion would be avoided.

## 4. Contaminated water

- Yesterday (5<sup>th</sup> April) international mass media were full of the news of release of some 11,500 tonnes of "contaminated" water. The government's announcement was





Addendum – my earlier e-mails:

From: Taka Hiraishi <hiraishi@iges.or.jp> To: " " Date Fri, 08 Apr 2011 13:30:40 +0900  
Subject: Fukushima Update

Dear Friends,

As many of you may know I am right now in Bangkok in the middle of UNFCCC AWG meetings. Unfortunately I do not see much amazing new agreements here, though there are very eager discussions. Actually today is my last day in Bangkok, and am returning home tomorrow after my four weeks.

Of course, I have not forgotten Fukushima, and regularly monitor the environmental radiation levels, public announcements by Governments and TEPCO, but there has not been no big news -- no news is generally a good news (e.g., environmental radiation levels are declining at most of locations, emergency actions on the site is steadily advancing, etc.)

Water release to the sea was a bad news, but very objectively speaking, the water (11,500 tonnes!) contains very low level of radioactive substances (only 8 Bq/cc - similar level as some natural mineral spa water -- See: <http://kadoyasan.com/radium-world.html> or <http://ja.wikipedia.org/wiki/ラドン#.E3.83.A9.E3.83.89.E3.83.B3.E6.B8.A9.E6.B3.89>), and the release was, in my personal view, fully justifiable so as to prevent future eventual leaks of higher level water and to advance their containment activities on site.

#2 and #3 are, sort of, in stabilised condition (including continued leakage). I personally consider that the reactor #1 development needs some attention, but there has been little (or no) journalists' attention on this. See: [http://www.nisa.meti.go.jp/earthquake\\_index.html](http://www.nisa.meti.go.jp/earthquake_index.html)  
<http://toofuya-en.blogspot.com/>

My current short assessment is:

a. Except the case of the reactor #1, they have gone through the emergency situation. (such as so-called "melt-down" or large scale physical bursting of reactors or reactor containers.) (I am assuming that #1 can be somehow managed ....)

b. They are now moving into the second "containment" stage. Cooling must be contained, hopefully, with recovered or re-constructed internal cooling system. Safe storage of debris, contaminated water (every hour some 25 tonnes of water is added to the reactors, and the water must be staying somewhere....) is a huge challenge for several months. We should not forget the needs of local people, and their economy. A wider evacuation plan has to be elaborated and implemented as a matter of urgency.

c. After b. a long-term reconstruction has to be done. . . This might take decades....

I am coming home tomorrow!

Taka

Attached:Taka&Nuclear.docx (some colleagues have seen this earlier.)

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Mon, 04 Apr 2011 21:21:29 +0900 Subject: Re: Fukushima  
nuclear accident: (29th March) Corrected version.

,

You should have read this chain from the start. Today, TEPCO in agreement with the Government started releasing of 13 kilo tonnes of water (low level radiation water which had been kept in their tank) to the sea. This water's radiation level is 8 Bq/cm<sup>3</sup> (of I-131). (Some 40 times higher than the drinking water standards - only 40 times ..).

Of course I am not saying that they can release it because the radiation level is low. We need to think of quantity of radioactive substances.

They have already been leaked to the atmospheric environment, and what we have to see is what this release to the sea means.

Chernobyl's release figure is a total (as expressed in I-131). Of course we do not know yet what kind of amount of radioactive substances will be released from those six Fukushima reactor facilities in the end, but the amount we are now talking as a release to the sea is a tiny, tiny portion of "all potential release", and this "all" will be hopefully smaller than that of Chernobyl.

This is the reason why I shouted "this kind of unscientific news bewilders people. Journalistic ...." There is no common sense in writing this kind of ridiculous article.

Will you recalculate it please?

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: " " Date Mon, 04 Apr 2011 14:24:08 +0900 Subject: Fukushima -  
what is happening? (4 April 2011)

Dear Friends,

a. Generally, environmental radiation levels are slowly going down - generally going closer to "natural" levels. This is partly because the North-West winds have prevailed, and there has recently been no rain, nor no new explosive additional emissions. Some locations near the nuclear power station continue showing high level of radiation, which, in my personal view, special actions.

b. At the site, cooling efforts continue, though the leakages are yet to be tackled. Facilities connected to reactor #2 and #3 are definitely leaking, the high level radiation from water in turbine house underground water is not yet accounted, nor they do not know the cause of high radiation from water in trenches.

c. They found a high level radiation water leaking to the sea, which has excessively monopolised the journalists' attention. I have heard a lot of extremely technical exchanges how to stop the water itself, but nothing about where the radioactive substances in the water come from. (By the way, my understanding is that the water hole comes only in ebb time (and for high tide times, sea water must be seeping into the wall), but some people seem to have an impression that contaminated water from reactor systems are "gushing out" to the sea. . . .) We need good answers to these points, before you formulate your impressions.

d. I am getting tired of observing the press conference. The press people ask for their articles, but do not address the core questions, such as: - Where is the added water going? (They are putting in close 10 tonnes per minute kind of cooling water to each reactor - where do they go?

- Not much discussions on the cause of high level radiation radiation of turbine house underground. (10,000 times higher level than normal reactor water does not mean anything, because primary cooling water is nearly clean of radiation. I wrote of my guess on this earlier.) I have been tired of hearing of the confusion of waters of reactor house and turbine house, and confusing image connecting all three different water bodies, (i) reactor house, (ii) turbine house, (iii) trench water, and (iii) water in the inspection hole - the linkages between them are yet to be elaborated.

- There are still lack of understanding between radiation strength, radiation received in specific time frame, and amount of radioactive substances. These are all related, but it is simply wrong to compare the radiation received from chest Xray (- 0.05 mili Sv/inspection) with sub-micro Sv/hour level environmental radiation. There have been too many "safety" declarations.

- The total amount of radioactive substances, which might have emitted already, which might continue emitted, .... Without this, Japan will continue to be blamed as an historic polluter - she might become one, though. ..

Taka@BKK

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Sat, 02 Apr 2011 17:27:54 +0900 Subject: Fukushima nuclear accident: (2nd April)

Dear Friends,!

Absence of my mail does not of course mean that I have lost my interest in this. Simply stated I have not been able to add meaningful analysis based on new quantitative information.

Since this morning, there were some international media coverage to the effect that a new leakage to the sea was found. But I am not able to assess the significance of this leakage - qualitatively, yes, there seems to be a leakage, but it does not mean much unless we know the amount of radio-nuclides in the water flowing into the sea in a quantitative manner. There are leaks and higher radiation levels are known. Thus addition of radioactive substances to the environment has been known.

Thus, unless we know the quantity of radioactive substances leaking to the sea, this kind of news is meaningless. More important point is what caused this higher level of radiation in the "inspection pit" which is close to the sea. Where did they come from? Through electric power cable piping? From the rainfall? There has been no explanation on possible leakage route "More than 1000 mili SV/hour in a semi-closed small space does not have much information. QUANTITAVE discussion is necessary.

Apparently they do not have access to reactor houses, and therefore they do not know the leakage there. (Gauge pressures of #2 and #3 containers (not reactors) are nearly zero, and this means there is some leakage somewhere around. (This would mean, probably, leaks from facilities connected to the container.) They continue adding 7-9 tonnes of freshwater to #1, #2, #3 reactors but nobody explains (or asks) where this water is going?? The causes of the highly contaminated water in the underground rooms of turbine houses have not been analysed. Till the water is pumped out to tanks, they can not step in those houses, only after which they can obtain some insights. (This would take, at lease, a few more days.)

Thus I am short of relevant information to write to you.

Otherwise, environmental radiation has been gradually falling in nearly all areas. Some areas near the reactor site show high level of radiation.

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To Date Thu, 31 Mar 2011 10:59:16 +0900 Subject: News on  
Fukushima (31 March at 11:00 (JPN time))

Dear Friends,

Environmental radiation levels and their trends have not changed significantly - except in areas near the reactors, environmental radiation levels are not extremely high level.

[http://www.mext.go.jp/english/radioactivity\\_level/index.htm](http://www.mext.go.jp/english/radioactivity_level/index.htm)  
[http://www.mext.go.jp/a\\_menu/saigaijohou/syousai/1303747.htm](http://www.mext.go.jp/a_menu/saigaijohou/syousai/1303747.htm)

This can be considered a sort of good news among more alarming news.

The Nuclear Energy Safety Agency (let me call it "NESA" for the time being.) explained yesterday night (Japan time):

- a. They found a new water patches in th "Central monitoring .... Office", showing relatively low radiation.
- b. As for the water in the "trenches", they now consider that the water inside will be (i) tsunami water, and (ii) subsequent precipitation (gathering radio nuclides from the environment). They are talking of low radiation from this water.
- c. Removal of water from #1 turbine house underground is temporarily stopped because the tank being used is nearly full. They are looking for the other tank(s).
- d. Leakage from reactors #2 and #3 exists and they are faced with a serious dilemma - they need to feed cooling water, and at the same time need to deal with contaminated water. (I am not aware of any clear explanation on the cause(s) of high radiation level of waters in the

turbine house.) They are not able to identify the status of reactors, containers, suppression chambers and any facilities connected to them - due to high radiation levels.

e. At the press conference, NESF talked of difficulties of cooling of #2 -- externally supported pump failed, and then tube of fire engine failed....

The NESA spokesman was of the view that, though the problems still continue, the situation has passed the extreme emergency situation which did exist

.

Through the Ustream I can not see the interview scheduled at 10:00 (Japan time) -- it seems that it is delayed by 60 minutes??? (I hope that this delay does not mean anything very serious. I need to sleep.

Could somebody watch this . . .) <http://www.ustream.tv/channel/iwakamiyasumi3>

Since yesterday, I have not been able to find any interviews of TEPCO (which I considered most informative.)

Good night.

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Tue, 29 Mar 2011 13:15:55 +0900 Subject: Fukushima nuclear accident: (29th March)

Dear Friends, Good Morning!

1. Good news, first:

1-a. In Yokosuka, there was a hump on 27th March, but generally environmental radiation is decreasing. Some of them may be considered close to "natural".

[http://www.atom.pref.kanagawa.jp/cgi-bin2/telemeter\\_map.cgi?Area=yokosuka&Type=WM](http://www.atom.pref.kanagawa.jp/cgi-bin2/telemeter_map.cgi?Area=yokosuka&Type=WM)

1-b. Radiation through water supply does not cause major concern.

1-c. Overall, environmental monitoring trends are similar to the earlier situation. Generally getting safer (except certain locations).

[http://www.mext.go.jp/english/radioactivity\\_level/detail/1303986.htm](http://www.mext.go.jp/english/radioactivity_level/detail/1303986.htm)

1-d. Freshwater (rather than sea water) is used for more reactors, and external electric power is increasingly used. (This is being realised by dedicated workers in the hazardous environment, of course.)

2. Continued concerns:

2-a. Fukushima area - radiation at some points are high.

[http://www.mext.go.jp/a\\_menu/saigaijohou/syousai/1303747.htm](http://www.mext.go.jp/a_menu/saigaijohou/syousai/1303747.htm)

2-b. Uranium has been detected in soil samples but the measured levels are found not to cause hazards. TEPCO will continue monitoring.

2-c. Water samples from #2 turbine house have high radiation, and they also found contaminated water in trenches. They are trying to move the water to secure containers.

2-d. A high level of radiation within the houses continue, and work is restricted.

3. New information.

Following information is available on international spread of radiation.

(See the url, shown below and the attached file). These appear alarming, but in my humble opinion, they tend to discuss together (without properly linking them) of (i) detection (at an extremely low level) by CTBT network, and (ii) model simulation of diffusion of contaminated air mass, which gives an awful image. Basis of estimation of amount of potential emission is not very clear either, but it is factually true that Fukushima reactors contain far larger radioactive substances compare with Chernobyl, but that the leakage from them to the open environment is still considered largely contained. I have not seen any estimation of potential amount of

radioactive substances which may be leaking. I am sure that this information will become available soon, so that we can see the situation in a more quantitative term.

<http://www.newscientist.com/article/dn20285-fukushima-radioactive-fallout-nears-chernobyl-levels.html>

4. I regularly observe the press briefing of TEPCO, titled "iwakamiyasumi" <http://www.ustream.tv/chan>. This is in Japanese, but informs details of technical difficulties. I am impressed by the sincere attitude of TEPCO people, including Vice-President Muto. You may find, as always, some irrelevant and irritating questions by journalists.

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Mon, 28 Mar 2011 14:55:51 +0900 Subject: Re: Fukushima nuclear accident (For your weekend!)

I know that they are now faced with the difficulty of storing contaminated water they found in the underground floor of the turbine houses, and they are discussing usage of other tanks and even constructing temporary (but sealed) tanks.

There seem to be five kinds of water.

- (i) the contaminated water in the underground room of turbine house.
- (ii) leaked water in the reactor container house (this has not been discussed yet, but since it has been confirmed that the #2 reactor container has leakage, it is likely that there is some water. . . )
- (iii) Overflow water as a result of water addition to pools (by fire engine, etc.)
- (iv) condensation water.
- (v) other un-detected water,

I have not found an answer to my question - where the cooling water is going. This morning at TEPCO press conference they were talking of addition of a few tonnes of water per hour. They also said that they are trying to reduce the addition speed only to the level of speed which keep the water level in the reactor. This means to me that the added water vaporises and then condensed back to water - somewhere, usually a condenser attached to the container. These have not been asked, nor answered.

Taka



----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: " Date Mon, 28 Mar 2011 03:55:37 +0900 Subject: Fukushima  
nuclear accident: 10 million times or 100 thousand times.

Dear Friends,

Since my mail of yesterday, there were some big news - ups and downs. Let me explain:

a. I talked of 10 million times higher radiation levels and stated, "(i) normal level in the reactor is actually very low in the Boiling Water reactors, and therefore the steam can be sent to turbine for electricity generation. Thus, using "10,000,000" is not very informative." This was confirmed by the TEPCO Vice-President, when they rectified that it was 100 thousand, not 10 million. Vice-President also said that usually the radiation level of reactor water is in the range of  $1 \times 10^2$  Bq/cm<sup>3</sup>, 10,000 times lower than the Japanese regulation level. Thus, as I said earlier, their comparison with normal reactor water is really misleading.

b. This detection error was due to the mistake of identification of peaks in the measurement chart - I guess it is the chart of nuclear weight-spread gamma-radiation strength. They mistook one peak of Caesium-134 for Iodine 134, and they found that there was no I-134. New detected radiation was some  $2 \times 10^7$  Bq/cm<sup>3</sup> (which was  $2.9 \times 10^9$ , yesterday).

c. In the meanwhile, CNN jumped up, and one nuclear analyst stated that the current situation is unprecedented, even over Three Miles and Chernobyl. He talked of possible domino-melting down of 4 reactors. It was really disgusting, I have to say. BBC is more restrained.

d. In Yokosuka, there was a hump on 27th March. Did it rain ?  
[http://www.mext.go.jp/english/radioactivity\\_level/detail/1303986.htm](http://www.mext.go.jp/english/radioactivity_level/detail/1303986.htm)

e. Environmental monitoring trends are similar to the earlier situation.

[http://www.mext.go.jp/english/radioactivity\\_level/detail/1303986.htm](http://www.mext.go.jp/english/radioactivity_level/detail/1303986.htm)

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: " Date Sun, 27 Mar 2011 16:58:14 +0900 Subject: Fukushima  
nuclear accident (For your weekend!)

Dear Friends,

1. Yokosuka area's radiation continues declining: [http://www.atom.pref.kanagawa.jp/cgi-bin2/telemeter\\_map.cgi?Area=yokosuka&Type=WM](http://www.atom.pref.kanagawa.jp/cgi-bin2/telemeter_map.cgi?Area=yokosuka&Type=WM)

2. Tokyo, Chiba, Ibaraki areas continues showing similar trends  
[http://www.mext.go.jp/english/radioactivity\\_level/detail/1303986.htm](http://www.mext.go.jp/english/radioactivity_level/detail/1303986.htm)

3. There was a news on highly contaminated water in the turbine facility house of the reactor #2.

3-a. As I wrote yesterday, this does not necessarily mean that there is a new leakage route. It is more likely that this leakage route has been there, but was not known. (My view is based on the fact that environmental radiation has not shown any new increasing trends.)

3-b. "More than 10,000,000 times higher than the radiation from the reactor water in normal situation" sounds awful. Let me add some personal guesses -

(i) normal level in the reactor is actually very low in the Boiling Water reactors, and therefore the steam can be sent to turbine for electricity generation. Thus, using "10,000,000" is not very informative.

(ii) By the lowering of water in the reactor pressurised vessel, fuel rods have been damaged and radioactive substances moved out to water, and the radiation from water in the reactor have increased to an "abnormal" level.

(iii) This high level radiation water was found in the turbine house, not in the reactor house. This means that there is actually leaks from the primary steam circuit, which has not been mentioned at all so far. It is known that #2 reactors's suppression chamber was damaged but I do not believe that this leak caused high level water in the turbine house.

These are only my guesses, but I do have concerns that the similar situation might exist also for #1 and #3.

Let me again say that this news does not necessarily mean new leakage.

4. I am still curious - what is happening with the added water? They have added lots of water (sea water earlier, and now they switched to fresh water, not yet purified water.) but they never make it clear on where the H<sub>2</sub>O went. . . Salt must be in the reactor or reactor container, but where did steam or water go?

5. In the meanwhile, <http://www.bbc.co.uk/news/world-asia-pacific-12872707>

Wade Allison, University of Oxford is of the view that current standards for radiation is 1,000 times too stringent. I do believe that radiation standards are set at very cautious levels, but it is so because we do not have much experiences.

<http://www.bbc.co.uk/news/world-12860842>

Have a nice weekend!

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Fri, 25 Mar 2011 15:05:13 +0900 Subject: My routine  
monitoring on monitoring

Dear Friends,

Good news: 1. As I predicted, water radiation level in Tokyo has gone down to below 100 Bq/kg (water), though water radiation levels tend to be still high.

2. Environmental radiation levels are gradually decreasing (except areas close to the reactor site.) (We need to see the radiation levels when rain comes.)

Bad news: 1. Judging from the industrial accidents, #3 reactor system has minor leakage. (I wrote "minor", because the container has positive gauge pressure.)

2. High level radiation has been detected at a large number of sites especially in Fukushima prefecture, but some announcements seem to be misleading (to safe side).

3. "Detection of radiation" is reported increasingly widely - unavoidably

.

Some materials: a. Attached is a set of useful monitoring sites (I routinely use this.).

Most of them are in Japanese, but I am sure you have other useful urls that you may wish to share with colleagues.

b. INES Pamphlet: <http://www.iaea.org/Publications/Factsheets/English/ines.pdf>

Taka

Attached:Monitoring.lzh

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Thu, 24 Mar 2011 06:44:28 +0900 Subject: As rain has moved  
away to the East, radioactivity level is settling down.

Dear Friends,

a. Radiation monitoring results at Yokosuka monitoring stations appear to be generally declining, though they are still higher than 100 nano Sv/hour. But they are going lower!  
<[http://www.atom.pref.kanagawa.jp/cgi-bin2/telemeter\\_map.cgi?Area=yokosuka&Type=WM](http://www.atom.pref.kanagawa.jp/cgi-bin2/telemeter_map.cgi?Area=yokosuka&Type=WM)>

b. Overview of contamination: <<http://atmc.jp/water/>> This website may be of some use to see overall contamination levels over Japan, even including the Fukushima reactor site (part of it, yet).

If you click on the small graphs, you can enlarge them. This sight gives you air, water, precipitation (wet and dry) radiation values. (They are in Japanese, but translation seems to be available by pushing language button on top left of the page. Please note, as always, that those numbers are often peak levels.)

However, because those pages are meant to give the overall views, precision might be missing. For details, you may wish to check this or other more specific pages:  
[http://www.atom.pref.kanagawa.jp/cgi-bin2/telemeter\\_map.cgi?Area=yokosuka&Type=WM](http://www.atom.pref.kanagawa.jp/cgi-bin2/telemeter_map.cgi?Area=yokosuka&Type=WM)

One thing I noticed was that the 209 Bq/kg (water supply) level, which we extensively talked yesterday) was an extremely high level, even higher than the water supply quality at Hitachinaka area or Utsunomiya area. I would not call it a detection error, but logically speaking (according to my personal logicism!) that kind of level will not continue long.

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Tue, 22 Mar 2011 22:45:41 +0900 Subject: Re: How to assess the radiation levels and contamination of water and sea water

Dear Friends,

a. The attached two images show you past trends of radiation in the vicinity of the IGES. In my earlier mails, I reported on two peaks and rather quick decline of environmental radiation. However, I have noticed that from yesterday (21 March) , there emerged a new peak. The peak levels are 157 nano Sv/hour and 114 in these cases. These levels are in the range similar to "natural radiation" and they are not something to worry about. I feel, nonetheless, somewhat concerned, because I am not aware of any incidents involving pulse emissions from those nuclear reactors in the last few days. (One possible explanation is that these peaks are related to the change of wind direction, I guess.) We need to continue checking the change of these levels.

b. Contamination of water, vegetables and raw milk in Tohoku area is something un-avoidable, and indeed the Government had to take legal actions to restrict the marketing of them. There were reports on contamination of water even in Tokyo area, but the levels are very low and would not cause any health impacts. Local sea water contamination around the reactors were detected at a rather high level, but this is not something un-anticipated, and it will not cause any immediate health impacts. Fish (both marine and lake/rivers) would need to be monitored in the future though.

c. There has not been much news on reactors #2, #3 and #4, except cooling by fire engines and connection of external power lines to the facilities. I am still concerned with in particular #2 and #3, and keenly awaiting good news on them.

Finally, I am attaching also an excel table (conversion tool) for your eventual use - to convert hourly values to annual values so that you can see the significance of measured levels of radiation. Please read the "Important Notes" section. Please do not conclude, for instance, that (i) compared with the X-ray radiation, environmental radiation is very high, or; the other extreme: (ii) compared with current environmental radiation levels (which are not far away from "natural radiation" levels in Tokyo/Yokohama/Yokosuka areas, mammogram is very dangerous. This table should not be used for risk assessment purpose, because impacts are not mechanically proportional to the time and dose.

Taka

Attached:Nishi-Itsumi\_0321\_Month.jpg Attached:Highland\_03\_21\_Month.jpg  
Attached:Sv\_Conversion\_TH\_expanded.xlsx

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Sat, 19 Mar 2011 16:39:28 +0900 Subject: Fw: How to assess  
the radiation levels

Dear Friends,

Let me add a few pieces of information on radiation monitoring so that you can understand the risks and safety of environmental radioactivity level

a. Basics a-1. You need to differentiate the strength radiation expressed usually by "per hour" (e.g., nano/micro/mili Sievert/hour), and the annual dose (often expressed in mili Sv per year.) When you wish to understand monitoring results, please keep this in mind.

a-2. At an extremely high radiation level site (such as at a nuclear accident site), short term exposure matters. Short-term health damage could result at an environmental radiation in the range above 100's of mili Sievert/hour level. Fortunately you would not experience this.

High level gamma ray radiation can be serious in the vicinity of irradiated materials.

a-3. Long-term impacts may be very broadly categorised into two different groups. One: long-term exposures through atmospheric contamination, and Two: long-term impacts of contamination accumulated in water, soil and food.

b. "Natural" radiation level b-1. Radiation comes from natural environment especially Radon in the ground, etc. Thus "natural" radiation level differs among the locations, the famous high radiation locations are; Ramsar: 260 mili Sv/year, Garapari: 10 mili Sv/year. Often 2.4 mili

Sievert/year is used as a typical "natural" radiation level. If you do a quick simple calculation (by dividing them by 8,760 (number of hours in a year), you will get 29,700 nano Sv/hour, 1,140 nano Sv/hour, and 270 nano Sv/hour, respectively.

b-2. Environmental measurements showed: b-2-1. As you saw in the attachments of my earlier mail, Kanagawa stations recorded two peaks or above 200 nano Sv/hour, and subsequently went down to below 50 nano Sv/hour level.

b-2-2. Some monitoring stations have records exceeding 1,000 nano Sv/hour level and some remains at the level of high hundreds of nano Sv/hour level. These levels look extremely high - if we say that these hundreds nano Sv/hour can be hundreds times higher than "natural". However, if you compare them with the b-1 cases, you may get to a different conclusion. (I am not insisting that we can forget about those monitoring results, at all.)

b-2-3. Often we hear statements that X-ray examination 50 will be micro Sv, comparing it with environmental levels (two digits nano Sv/hour). This is somewhat un-understandable comparison. You do not compare the car speed and distance the car is making.

b-2-4. For the big travellers: You will receive 45 micro Sv/hour of radiation - some 350 micro Sv/flight (of 8 hours). If you have ten international missions per year, 7 milli Sv/year. You may not wish to compare this is 2.4 milli Sv/year (natural radiation).

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Fri, 18 Mar 2011 21:05:06 +0900 Subject: Re: How to assess the radiation levels

Dear Friends,

I have just sent to my colleagues information on what INES means.  
<http://gnsn.iaea.org/regnet/Pages/INES.aspx> If you want to know more details, [http://www-pub.iaea.org/MTCD/publications/PDF/INES-2009\\_web.pdf](http://www-pub.iaea.org/MTCD/publications/PDF/INES-2009_web.pdf)

This change of category does not change the contamination levels, of course. Contamination levels are those which have been monitored. I apologise in this context that in my earlier mail I mentioned "micro Gy and Sv, but as you might have noticed in the photo image they are nano Gy and nano Sv. I was confused with the higher level of contamination on sight. Again this does

not change the status. Contamination levels in Kanto areas are what those images (or others, you may wish to check from the website.)

Finally, a friend inquired into the possibility of accumulation of radioactive substances in the environment, such as soil, food or water.

I would say, it will occur, but we should always consider the level of contamination and the species. The AIST has uploaded the analysis on this question (There is a table talking of nuclear species in the middle of the page, though it is in Japanese).

<http://www.aist.go.jp/taisaku/ja/measurement/index.html> The message was that I-131 (highest recorded) has a half-life time of 8 days, and Te-132, 32 days . Longer life species (Cs-137, 30 years, and Cs-134 30 years), needs careful attention. (In this table, I think the peaks (which I mentioned in my earlier mail) are also recorded, and later radioactivity measurement have declined.

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Fri, 18 Mar 2011 18:56:21 +0900 Subject: How to assess the radiation levels

Dear Friends,

I wish to share with you how I assess the current radiation levels.

Mass media carries often the news talking of only peak levels. If you see only those peak levels, you might come to a conclusion that a wide range of areas have been contaminated.

Just wait! As you are fully aware, all the environmental pollution levels highly fluctuates as the air mass moves around. Radioactive matters are also environmental pollutants and behaves similarly like SO<sub>x</sub>, NO<sub>x</sub> or SPM in the air. Thus environmental experts use hourly values, annual averages, 98 percentile figures, etc. of air pollutants. Depending on contaminants, peak levels are not so relevant to health impacts. (One exception from this is the case of direct gamma ray irradiation from certain radioactive matters, but this applies only when you are physically very close to the radioactive solids (or sometimes liquids).



Mr Sato circulated guidance materials (in Japanese and English), which contained an url on monitoring stations and their records.

<http://maps.google.co.jp/maps/ms?ie=UTF8&brcurrent=3,0x34674e0fd77f192f:0xf54275d47c665244,0&oe=UTF8&msa=0&msid=208563616382231148377.00049e573a435697c55e5>

Some of those stations have radiation level trends, and I am now attaching two image files of the Nishi-Itsumi (?) Station in Yokosuka (one monthly trend and the other 24 hours trend.) The monthly record shows,

(i) natural radiation levels including those days even before the accidents are shown, and it says that natural radiation level is usually between 10 micro Gy/hour (please take it that Gy and Sv are the same, for the time being). It shows also past few peaks correspond to rainfalls. (Raindrops washes down natural radioactive substances to ground.) You may know that Japan is not a country that has extreme high level of natural radiation level.

(ii) Two big peaks appeared between 15th and 17th (?) March. The peak levels are something what we should be concerned, but environmental levels quickly fell down to below 50 micro Gy/hour. More recent 24 hours records also show gradual decline. (My very, very personal guess is that these two peaks are the results of two hydrogen explosions in Fukushima site, but I do not have any means to confirm this.)

From the above my current conclusions are:

a. Unless there is any major additional leakage, environmental radiation level will not go extremely higher than the natural level in Tokyo-Yokohama-Yokosuka areas. There may be some peaks still occurring but they would be smaller than those already observed.

b. Water supply to the reactor #4 cooling pool was a challenge (because physically water bombing could have caused dispersion of significant radioactive substances, but fortunately there was no major explosive incidents. No big peak has been recorded in the stations which I have checked (this needs to be confirmed.) It was quite a relief for me, personally speaking.

c. There is no doubt that there is a leakage at the reactor #2 (its suppression chamber, to be exact). With the initiation of cooling system using external power supply would reduce the occurrence of further leakage, but we can not completely rule out the possibility of further leaks as time passes. Environmental monitoring and relief actions for the neighbour areas should be initiated.

d. Thanks to the devotion (literally "devotion") by the TEPCO on-site staff, self defence forces, police and fire control officers, catastrophic accidents might have been prevented.

Let me again state that this is only my personal assessment. You may have yours.

Taka

Attached:Yokosuka\_24hrs.jpg Attached:Yokosuka\_PastMonth.jpg

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Thu, 17 Mar 2011 12:15:15 +0900 Subject: Re: Greetings  
from ..., Berlin

Dear ...

Thank you very much for your mail and kind words.

It was really a major disaster. Probably more than 10,000 people perished, and a large area, including several cities and townships were swept away to the sea. Aftershocks still continue. Two nuclear power stations were seriously damaged, to the effect that the core cooling system is unstable in at least two nuclear reactors. There has not been any significant radioactive leakage.

As news reveals more damages, we recognise that Japan will face with major challenges - recovery from devastating situation.

From climate viewpoint, Japanese people lost again their confidence in nuclear energy. At the same time, Tokyo will face with major electricity deficiency - because these earthquakes mean loss of several gigawatt per hour electricity power generation for the coming few years. (I think my quick calculation is correct - it is so huge, and I can not be sure....) According to TEPCO, Tokyo area is going to experience "scheduled power cuts".

Even in my life time, Japan has gone through a number of difficult times, and I sincerely hope that we can again see miraculous recovery.

Taka

PS: There are reports on European mass-media, including German. Lufthanza apparently decided that they avoid flying to Tokyo. There was a gossip that the German Emergency Rescue

Team sent to Japan after the earthquakes was sent to Osaka. Many Europeans only recall Chernobyl - but fortunately (so far) the Fukushima incidents will be contained though with some minor nuclides leakage - it is not an open fire of a nuclear reactor, but many Europeans can not differentiate them. Sad, isn't it

.  
----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Wed, 16 Mar 2011 13:52:02 +0900 Subject: \*\*\* Very  
Personally,

Dear ,

I understand. . .

Apparently, European countries are very much concerned with the situation. As I have been writing, I am not very optimistic about the situation. #2 reactor has a minor leak, #1 & #3 are not yet stable, and #4 rod cooling pool is heating up. This morning's news, the "white cloud" from #3" was extremely alarming.

However, very objectively speaking, even in the worst case scenario, Fukushima will not become Chernobyl, though it might go up a half step higher to Level 4.5. Again very objectively speaking even in such a case, Tokyo will not be contaminated to the level of significant health risk.

Thus, it is understandable that some European countries have taken a very cautious approach.

Personally, I am leaving for an international mission for 4 weeks, starting tomorrow. I have been seriously thinking of staying with my family, deserting my IPCC responsibilities, but my assessment has not forced me to take such a decision.

We are all a small part of the history.

When I and you come back to IGES, let us drink and recall all the things that might have happened.

Take care! Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Tue, 15 Mar 2011 19:09:32 +0900 Subject: Re: [15 March  
17:20 Update] Travel, Blackouts

This is an informative article. I also believe that there is no imminent risk at the moment, though I would not say that "(T)he plant is safe now and will stay safe". It is too early to conclude so.

We need to address all the reactors separately.

#1: there was a hydrogen explosion. Dry fuel rods generated the hydrogen and it leaked out (through unidentified route such as de-gassing facility of primary water pipe or somewhere unknown.) Later they decided to open the "vent" of the reactor container and to inject sea water, and it appears that sea water is still flowing in. They believe that the situation is stable (this does not mean it is completely safe.

#3: Situation is similar to #1.

#2: This is still not stabilised. Earlier there was an "explosion", but I tend to believe that it was a physical rupture not an "explosion" (of chemical or nuclear reaction). These are two different things. Later, Government's assessment said it appeared that leak of from heat exchange connected to the suppression chamber.

My hopeful assessment is, thus, the pressurised nuclear reactor (that contains essentially all the radioactive substances) is not directly and widely open to the atmosphere. Nuclear reactor is connected to the suppression chamber through controlled valves, and hopefully, the suppression chamber is connected to heat exchanges (again through controlled valves), and the heat exchanges have rupture(s). There has not been clear announcement to say if my assessment is correct or not, but in view of the fact that subsequent environmental monitoring has not shown any continuous extremely high level, I am assuming that there is no major leakage from nuclear reactor to the environment. However, there is a leakage after the rupture . . . Government's most recent assessment was that they can not be certain if the sea water injection operation is stably on-going. This is definitely a matter of concern.

#4: There was a fire (not hydrogen explosion), and they have yet to establish the cooling pool of spent fuel rods has enough water inside.

It has been taking a long time for them to confirm this - some concerns.

There have been reports that temperature of the other spent fuel rods cooling pools is rising. This may be less urgent issue compared with the others, like #2 case, but I hope some attention will be made to avoid another hydrogen explosion

Environmental monitoring results indicate that there is some sporadic high level of measurements, especially one spot near #4, which prevented the workers access.

Otherwise, radioactivity has been detected very widely, but they are very low level, which does not pose health risk. Of course, basically, no additional radioactivity is the best, though.

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Tue, 15 Mar 2011 16:58:17 +0900 Subject: Re: radiation  
precautinary measures

My quick impressions are:

a. Obviously 400 mSv/hour is an extremely high level. More recent assessment says that this was probably caused by the remnants of debris from reactor #3 facilities (there was an explosion there yesterday), and the authorities' current assessment says that it is likely that this was caused by continuous emission of radio-nuclides or no increase of leakage. Since the location shows this high level workers are not able to work in the area. (We need to understand that the local direct radiation from broken construction materials (which does not move) and long-range observation of radio activity are of completely different nature.) A measurement at the gate once showed above 1 mSv/hour level but later it went low to hundreds micro-Sv/hour level) (I have to think that there is continuous leakage of un-known rate.)

b. Subsequent environmental measurements in power generation site have all shown lower radioactivity.

c. Measurements in Sendai, Tokaimura, Tokyo and Yokosuka (US base) show very low level of radiation but all are very low and do not pose any human health risks.

d. Fortunately there is a good monitoring capability by US Navy (up-wind from Hayama), and it will be unlikely that equipping IGES with measurement facility would have any value.

e. I do not have any strong views on work-at-home. It might reduce the risk of exposure (though extremely minor) in commuting, but Yokohama is closer to Fukushima, I think.

f. At present leakage of radio-nuclides is very low - no comparison with Chernobyl (One complete reactor exploded (or two - I do not remember well) released accumulated radio-nuclides!). It is far lower than the Three Miles case.

Touch wood, though.

I can not say Japan is completely safe, but the risk seems to be really negligible -- so far.

Taka

----- Original Message ----- From: Taka Hiraishi  
<hiraishi@iges.or.jp> To: Date Tue, 15 Mar 2011 11:31:04 +0900 Subject: Re: [15 March  
10:45 Update] Travel; Blackouts; Fukushima Nuclear Plant

Good information service, which I highly appreciate.

This morning news were alarming. There is now leakage from "suppression chamber (pool)" of the reactor #2 of the Fukushima Power station #1, though the leakage level is not yet clarified. This "suppression chamber" is connected to the "container" through control valve, and the container contains the nuclear reactor (pressurised and sealed body), which has a controlled connection with the rest to the container. Thus, the reactor itself does not have direct connection with the open air.

Right now Prime Minister Kan revealed that fire broke out at the reactor #4. Increased leakage of radioactivity has been observed. Chief Cabinet Minister Edano explained that #4 had not been functioning even before the earthquakes, and the fires are not related to nuclear activities.

Residents of 20 -30 kms range were advised to stay in their houses.

Edano explained that it seems that the leakage of #2 was through the heat exchange facility connected to the suppression chamber (TH: this was a relief for me because the leakage was not directly from the suppression chamber nor from the reactor vessel). He also reported high level of radioactivity (hundreds of milli Sievert level (not micro-Sv, which has been used earlier on the environmental measurements levels) near the reactors - Edano said this high level is considered to be related to the #4 fire. He explained that thanks to diffusion, it is expected that their impact would not be health-hazardous beyond 20 kms.

Taka

