Decree on failures of Governance and Human Rights in

Radiation Risk of Genetik Malformations and the selection-process protocols for External Experts in the matter of the proposed Swedish Final Radioactive Waste Repository at Forsmark

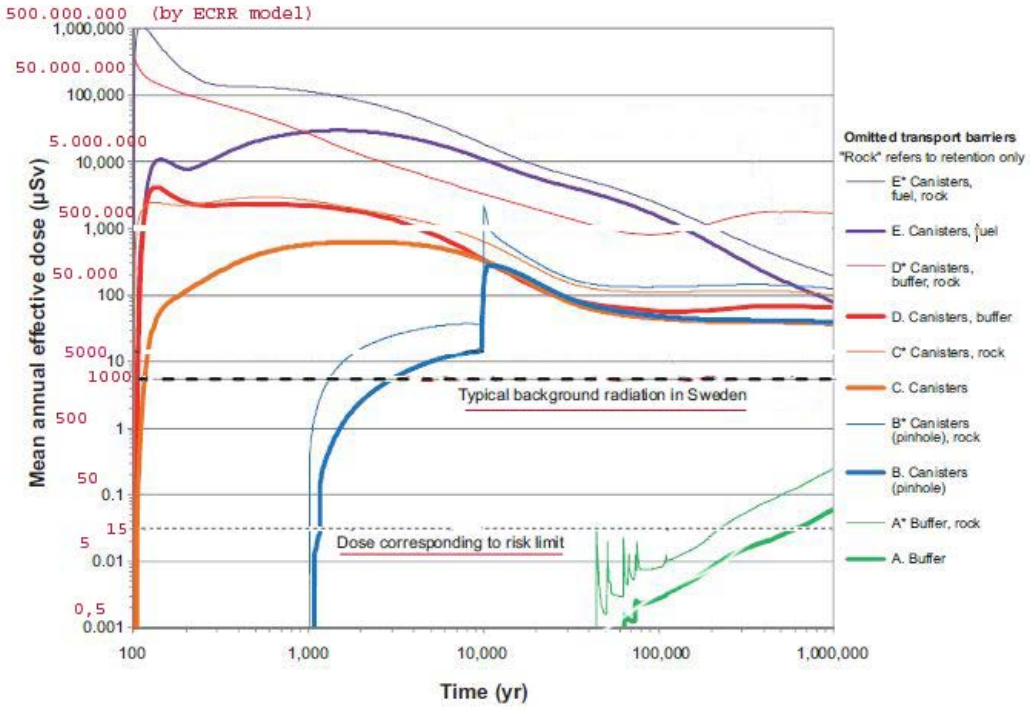

Figure S-12. Results of stylised cases to illustrate loss of barrier functions. Note that an omission of the "rock" barrier in these cases refers to omission of retention of radionuclides in the rock fractures only, whereas the favourable, low flow rate at repository depth and the favourable geochemical conditions are still taken into account. Y-Axis estimated Exposure by ECRR Model (www.euradcom.org)

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ÖSTERSJÖVÄLDET

Decree

Future of offspring of all of the inhabitants of the whole Baltic Sea Region in the 10 countries around the Baltic Sea is endangered by the Swedish Final Radioactive Waste Repository at Forsmark. Therefore the project of building Final Radioactive Waste Repository at Forsmark is categorised as genocidal corporate conspiracy against the peoples of the Baltic Sea Region.

1. Forsmark

1.1 Backgound

The Swedish Radiation Safety Authority (SSM.se) as well as the Environmental Court in Nacka have received SKB's (Swedish Nuclear Fuel and Waste Management Co.) application to build the final nuclear waste repository in Forsmark, Sweden. The question is whether SKB´s project is acceptable in the matter of choice of location and method to keep the 12,000 tons of the most radioactive nuclear waste produced by Swedish nuclear industry, separated from the living systems of the Baltic Sea region. The project suggests the disposal of the waste according to the KBS-3 method, in 6 m Copper cylinders, in tunnels 450 meters below ground. The area extends at Sea coast in the beautiful archipelago of Östhammar municipality, 100 km from Swedens capital Stockholm. Swedish court Mark och Miljödomstolen decides if SKB's application conforms to the Nuclear Industry regulations in the questions about whether (1) Forsmark is the best place and (2) if SKB-3 is the best method. SSM is an advisor to the Environment Court in the matter of environmental consequences. This is the last possibility for Societies affected to have a chance to leave input on the repository process or to impact the conclusions within the frame given by Espoo convention. The society´s right to address the project will be seen as passed after this.

1.2 Radioactive waste

A pivotal global issue for the development of nuclear energy and the Uranium economy is the disposal of radioactive waste. This problem has not been solved in any country. The issue is how to keep the radioactivity from the biosphere for the time it takes for it to physically decay to harmless non-radioactive material, and essentially this problem is insoluble. This is because the half-life of the main hazardous component, Uranium, is measured in billions of years, evolutionary timescales. For the alpha emitter Plutonium, the half life is some 25,000 years. For the high specific activity radioactive nuclides, Strontium 90 and Caesium 137 the half lives are more modest, some 30 years. The physical quantities are large. The quantities in terms of activity are enormous. The material is physically hot, that is, it self-generates heat, and has to be cooled. There are enormous technical problems associated with storing it and preventing its escape to the wider environment where it would poison huge areas of land, the water, the sea, the atmosphere and all living systems. The Fukushima catastrophe highlighted this since some thousands of tons of spent fuel were stored in water tanks on top of the reactors. When the water was lost, the spent fuel tanks exploded and vapourised large quantities of radioactivity. A spent fuel tank in Chelyabinsk exploded in 1959 and contaminated thousands of square kilometres making them uninhabitable and forcing mass evacuations

(Medvedev 1981). The quantity of spent fuel at sites like Sellafield in the UK and La Hague in France beggars belief and represents a continuous and increasing threat to Europe. As long as the nuclear reactors operate, more spent fuel is produced every year.

There are only two options: find somewhere to store it safely or shut down nuclear power. The USA has spent vast amounts of money on this problem with the proposed Yucca Mountain repository. It was abandoned. Who will find the solution? It may seem that Sweden and Finland will somehow solve the problem where everyone else has failed.

The project is a private one, being developed by SKB, the Swedish Nuclear Fuel and Waste Management Company. It involves astronomical quantities of money, but will allow the development of the even more astronomic money-generating nuclear energy project and will safeguard the shares of those who invested in the Uranium economy. So right from the start we should be on guard. Sweden has become a centre of interest for the nuclear industry in the last decade, with global companies like E.ON and Westinghouse taking control of earlier Swedish investments. Previously Swedish state-managed, now private global share holder owned Studsvik AB is expanding rapidly in the business of importing radioactive waste from global locations, diluting into non-radioactive material to a level just below the new EURATOM statutory limits and then exporting the new recycled "safe" material. In the process, very large quantities of radioactivity are tipped into the Baltic Sea, which is now acknowledged to be the most radioactive sea in the world, with levels of Caesium-137 in the silt at more than 100,000Bq/sq metre (measured and reported by HELCOM). The main source of the dangerous radioactive nuclide Strontium-90 contamination in the Eastern coastal Baltic waters is Studsvik. The Studsvik-exported radioactive metal and other material will form consumer materials like saucepans, spectacle frames, vehicles etc and when these are finally broken up the radioactivity will, of course, increase the levels in the environment in the normal way, just as if it had been released directly in the first place. But this way, the industry will not have to pay to store it or properly dispose it. Everyone in the industry gains. But of course not the public who fear that the cancer rates will increase along the shores of the Baltic Sea and near the site of the disposal operation. It is their right, according to various UN declarations, elaborated below, to be heard and to affect the outcome of decisions about such a development.

To legitimise the development of the Forsmark repository, the Swedish State has, under UN International Environmental Human Rights Laws, to consider and approve the project. This is a most important part of the process and so we will take some space to elaborate it.

2. Human Rights and the Environment

Ironically, since this nuclear project is to be resolved in Sweden, as early as 1972 the Stockholm Conference on the Human Environment addressed the interrelationship between Human Rights (as already enshrined in the Articles of the UN Declarations) and environmental protection. And at the 1968 Teheran conference, Principle 1 of the final UN declaration stated (Final Declaration 1972):

"Man has the fundamental right to Freedom, Equality and Adequate conditions of Life in an environment of a quality that permits a life of dignity and well being and he bears a solemn responsibility to protect and improve the environment ***for present and future generations***" (International Covenant on Economic, Social and Cultural Rights Dec 16 1966 993 UNTS 2, 6 ILM 360 1967)

22 years later UN Resolution 45/94:

"Recognises that all individuals are entitled to live in an environment adequate for the health and well-being and calls upon member states and intergovernmental and non-governmental organizations to enhance their efforts towards a better and healthier environment."

It follows that to those whose well-being suffers or might suffer due to environmental degradation Human Rights law currently provides the only set of international legal procedures that can be invoked to seek redress for harm that is the consequence of an act or an omission attributable to a State. The inclusion of INACTION is significant since most environmental harm is due to inactivity of the State. And thus whilst no international human rights procedure allows direct legal action against private enterprises or individuals who cause environmental harm, a State allowing such harm may be held accountable. As Judge Weeremantry of the International Court of Justice put it:

"The protection of the environment is a vital part of contemporary human rights doctrine. Damage to the environment undermines all of the human rights spoken of in the Universal Declaration."

Degradation of the environment impacts the right to health and the right to family when genetic or genomic damage is involved since human fertility is affected.
The procedural consequences of these international agreements, to which Sweden is a signatory, have been that there are

1. Rights to environmental information
2. Public participation in decision-making
3. Remedies in the event of environmental harm

The original Stockholm Principle 1 and later Rio Declaration both state

"Individuals shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities and the opportunity to participate in decision- making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings including redress and remedy shall be provided."

The 1998 Aarhus Convention (UNECE) states

"Every person has the right to live in an environment adequate for his or her health and well-being and the duty, ***both individually and in association with others*** *to protect and* ***improve the environment for the benefit of present and future generations"***

Article 1

"Citizens must have access to justice in environmental matters"

It follows that Public Participation in environmental decision-making is a right and

that there must be such participation based on the RIGHT of those who may be affected, including foreign citizens and residents to have a say in their environmental future

1. The right to be heard
2. The right to affect decisions
3. The right to remedy and redress

But the way in which this is being handled in Sweden, in the case of the Forsmark repository, is frightening in that its procedures, protocols and conceptual frameworks are philosophically and scientifically bankrupt, and if not changed, will inevitably and almost automatically (as we will show) permit the development of a project which will arguably ultimately destroy all life in the Baltic Sea and which many independent experts fear will harm all who live near it. The way in which this will be carried out would be entertaining if it were not terrifying. It is a perfect example of the failure of scientific reasoning though it may also be a good example of scientific dishonesty, bias and corruption. All of which are ongoing right now even in Fukushima, Japan.

3. Rights of Indigenous Peoples of the Baltic Sea Region to sustainable environment and our own indigenous decision-making institutions

Furthermore follows that even Declaration on the Rights of Indigenous Peoples reminds of those whose well-being might suffer due to environmental degradation and the right of indigenous people to use our own indigenous decision-making institutions.

Significant quotes from the Declaration on the Rights of Indigenous Peoples:

Recognizing that respect for indigenous knowledge, cultures and traditional practices contributes to sustainable and equitable development and proper management of the environment
Encouraging States to comply with and effectively implement all their obligations as they apply to indigenous peoples under international instruments, in particular those related to human rights, in consultation and cooperation with the peoples concerned
Article 29 p. 1. Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources.
Art. 32 p. 3. States shall provide effective mechanisms for just and fair redress for any such activities, and appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impact.

Article 18 . Indigenous peoples have the right to participate in decision-making in matters which would affect their rights, through representatives chosen by themselves in accordance with their own procedures, as well as to maintain and develop their own indigenous decision-making institutions.

4. The process

The Forsmark licensing process is, on the surface, straightforward. SKB have provided an environmental impact statement, 336 pages. Mostly it is pretty pictures, artists' impressions, without scientific substance. It barely deals with what everyone wants to know: the main reason why there would be opposition, the health effects consequent on a failure of the integrity of the waste storage. An early outline version of the EIS has been addressed earlier (Busby Feb 5th 2010) with a PDF and even a short video presentation on the issue:
(http://www.youtube.com/results?search_query=Chris+Busby+Forsmark&aq=f)

However, there is also a substantive SKB application to build the Final repository which runs to many thousands of pages in several reports that address the constraints of 2 Laws - the Environment and the Nuclear Technology Law – scrutinised by 2 institutions. The review of the SKB application will be made by the Swedish Radiation Safety Authority, SSM, and the Environmental Court. The Environmental Court decision will be influenced by the SSM review as SSM is adviser for the Court. Although the government then makes the final decision it will be influenced by SSM.

In order to base its review on unbiased scientific and expert advice, in making its assessment SSM will rely on the advice of *External Experts.* Such advice is necessary since SSM does not have enough "in house" experts on these issues, but in any case would want to appear to rely on external expertise to imply that somehow the whole process independently arrives at the correct conclusions, what they might call the "scientific conclusions".

And this is where the process collapses as a meaningful development. There are major conceptual and philosophical problems with the review process itself and also with the way in which the external experts have been be selected. Pr. C. Busby has made the main points already to the SSM on behalf of the European Committee on Radiation Risk, ECRR, but they have not been addressed or responded to. We will now turn to the problems.

5. The health effects of ionising radiation

The reason why people are afraid of ionising radiation is that it is genotoxic and causes cancer, congenital illnesses, and a wide range of non cancer illnesses, some would argue on the basis of very real data obtained from Chernobyl and Hiroshima, a non specific life shortening. It is also now clear that even at very low internal doses it increases infant mortality and foetal death and alters the sex ratio of children at birth due to selectively targeting girls or boys depending on the whether the mother or father are exposed (Scherb and Voigt 2011).

Results of numerous scientific studies (recent summary 2016 by Schmitz-Feuerhake, Busby, Pflugbeil; Genetic Radiation Risks –A Neglected Topic in the Low Dose Debate) show that currently by SSM.se used radiation risk model fails to predict the consequences of exposure to radiation and does not explain the epidemiological observations of increase in disease, death and infertility and therefore should be abandoned. Genetically induced malformations, cancers and numerous other health effects in the children of populations who were exposed to low doses of ionizing radiation have been unequivocally demonstrated in scientific investigations. Using data from Chernobyl effects a new Excess Relative Risk (ERR) for Congenital malformations of 0.5 per mSv at 1mSv falling to 0.1per mSv at 10mSv exposure has been estimated for mixed fission products as defined through external exposure to Cs-137.

The fear and interest in the Forsmark repository proposal is existentially reasonable and *Human Rights and the Environment* legislation is relevant here (see above). For it must be a human right to decide to refuse to have your environment contaminated with substances that appear from scientific evidence to have a finite probability of killing you or causing cancer or other diseases in your children, for example.

Currently, most governments of the world are modelling the health effects of exposures to ionising radiation on the basis of the risk model of the International Commission on Ionising Radiation. However, this model is arguably and evidentially wrong. It assesses internal irradiation from environmental pollution as if it were external radiation from gamma rays and employs a quantity called "absorbed dose" which is energy absorbed per unit mass of tissue. This can be defined for external irradiation but not for internal irradiation where the local energy density, or ionisation density, is commonly anisotropic, resulting in very high local energy deposition at the expense of low general energy deposition. **Important exposure domains in which this is an issue include inhaled and ingested hot particles and radioisotopes of Uranium, Strontium and Barium which have high affinity for DNA.** As a result, the ICRP model underestimates the health effects of these exposures by a factor now known to vary between 100 and 5000-fold. There is now peer-review published epidemiological evidence that this is true, and also theoretical mechanistic explanations why it is so. The ICRP model, developed in 1952 (before the discovery of DNA), has not kept up with scientific and empirical advances and also epidemiological evidence and is now arguably and evidentially bankrupt. This is a very serious matter and is principally addressed by an independent group of scientists founded in Brussels in 1997, the European Committee on Radiation Risk ECRR. The first ECRR report was published in 2003 and quickly translated into French, Japanese, Russian and Spanish (ECRR2003). The updated model was presented in 2010 (ECRR2010) and included evidence for its accuracy that emerged after the 2003 publication.

The ECRR model employs a method to assess radiation health risk from internal exposures to substances present in fission product fallout e.g. Plutonium-239, Strontium-90, Caesium-137 and Uranium 238. The method follows a similar development, which had been considered but abandoned by ICRP in the 1970s, to add weighting factors to nuclides which have high affinity for DNA. As is discussed in ECRR2010 the weighting factor ECRR model is remarkably accurate and can explain several studies which show apparently high risks at low doses, including childhood cancer clusters near nuclear sites and also increases in cancer after Chernobyl in areas of Europe. **A particular success was the ability of the ECRR 2003 model to predict the later findings of Tondel et al 2004 which demonstrated increases in cancer in municipalities of northern Sweden contaminated by Caesium 137 due to Chernobyl.** These areas were considered to be safe by the ICRP risk model which only considered the exposures as external radiation absorbed dose, and at the doses, which can be shown to be less than 2mSv, i.e. around one year's natural background no cancer increases should have occurred.

The banner headline is this: internal exposure to fission products from environmental pollution cannot be compared on an absorbed dose basis with natural background exposures. For these materials, the concept of dose breaks down, and this is accepted everywhere now, even by the ICRP. For a full discussion of this issue consult ECRR2010. Pr.C. Busby has argued this issue in many court cases in the UK and the USA and invariably the case has been found in favour of ECRR arguments.

The consequence is this: the public, who are exposed to radioactive contamination in the environment, are not being protected by the current radiation protection framework from serious adverse health consequences. At the same time, efforts to draw attention to this by a wide range of eminent independent scientists are ignored and the many peer reviewed research reports and papers showing that this is the case are ignored by the ICRP and the international radiation risk agencies. Within the context of the various United Nations Human Rights and Environment Directives this is a matter for the various States which are signatories to the UN Declarations and Conventions, and individual

citizens have the right of investigation, to affect decisions in this area, to remedy and to redress.

The nuclear risk agencies are quite aware of this potential danger to their projects and those of the nuclear operators and so they put in place various processes to pretend that these issues have been properly addressed, and that the public have some say in the developments that affect the contamination of their environment. This is the case with the Forsmark Final Nuclear Waste Repository project, and it is acknowledged in this paper, that the process itself is rigged to ensure that the final nuclear waste repository project on the very coast of the Baltic Sea, will go ahead.

A brief account of the Radiation Risk model of the ECRR and its application to the Forsmark Environmental Impact.

The European Committee on Radiation Risk was formed in Brussels in 1998 to address the perceived failure of the risk model of the International Commission on Radiological Protection, ICRP, to explain clear evidence of harm to health in populations exposed to internal (ingested, inhaled) fission-product and enhanced natural (e.g. Uranium) radionuclides. The radiation risk model of the ECRR was published in 2003 and introduced a system of weighting factors for specific man-made or human altered radionuclides that had increasingly contaminated the biosphere since 1945. Essentially, the problem is that certain radionuclides have evolutionarily novel ways of causing genetic and genomic damage, for example though their chemical; affinity for DNA (Strontium-90, Uranium). Based upon epidemiology, chemical affinity measurements, laboratory experiments with cell cultures and through theoretical calculations the system of weighting factors for specific radionuclides was developed. The model has now been applied to most of the situations where populations are exposed to internal radionuclides (Chernobyl, weapons tests fallout, nuclear sites) and shown to be largely accurate in its predictions of cancer rates and other effects.
As applied to the Forsmark EIS, the ECRR model significantly alters the exposure doses calculated by SKB, and especially for certain radionuclides, by a significantly large amount. In the short term (500y) the most affected radionuclides are Strontium-90 for which the ECRR combined weighting is w is 300 and Uranium. The most serious exposure in the long term will be from the element Uranium, which for a number of reasons has been massively underestimated in terms of harm by the ICRP model. For Uranium from the spent fuel represents by far the greatest mass. It has been characterised in terms of harm purely from the (incorrect) viewpoint of the ICRP risk model. The ECRR weighting factor for particulate and soluble Uranium is currently 1000. Therefore by applying the ECRR 2010 model all the releases from the repository will result in human doses many times greater that the limits proposed by SKB of 15microSieverts per annum. A complete calculation of the ECRR doses would be time consuming but possible if required. As an example of the qualitative change in exposure scenarios brought about by applying the epidemiologically justified ECRR model we use a very rough approximated overall ECRR analysis here below. The Figure below shows the real doses (red figures for μSv on Y-axis) based upon the application of a mean weighting factor Wj of 500 over the whole period of 1 million years made up of a value of 300 for mixed fission products in the early period and an overall final value of 1000 for Uranium in the long term. The dose corresponding to the risk limit of 15 μSv/y and the average background external annual dose of 1000 μSv/y given by SKB in their original version, has been adjusted accordingly and are shown as dotted lines with their titles underlined in red.

Fig 1. Application of an approximate ECRR 2010 risk model is shown with red colour typed numbers close to the SKB predicted ICRP doses presented as Fig S12 in the SKBs application as ***Calculation cases with hypothetical complete loss of barrier functions*** (page 37 in Long-term safety for the final repository for spent nuclear fuel at Forsmark Main report of the SR-Site project, Volume I, Technical Report TR-11-01).

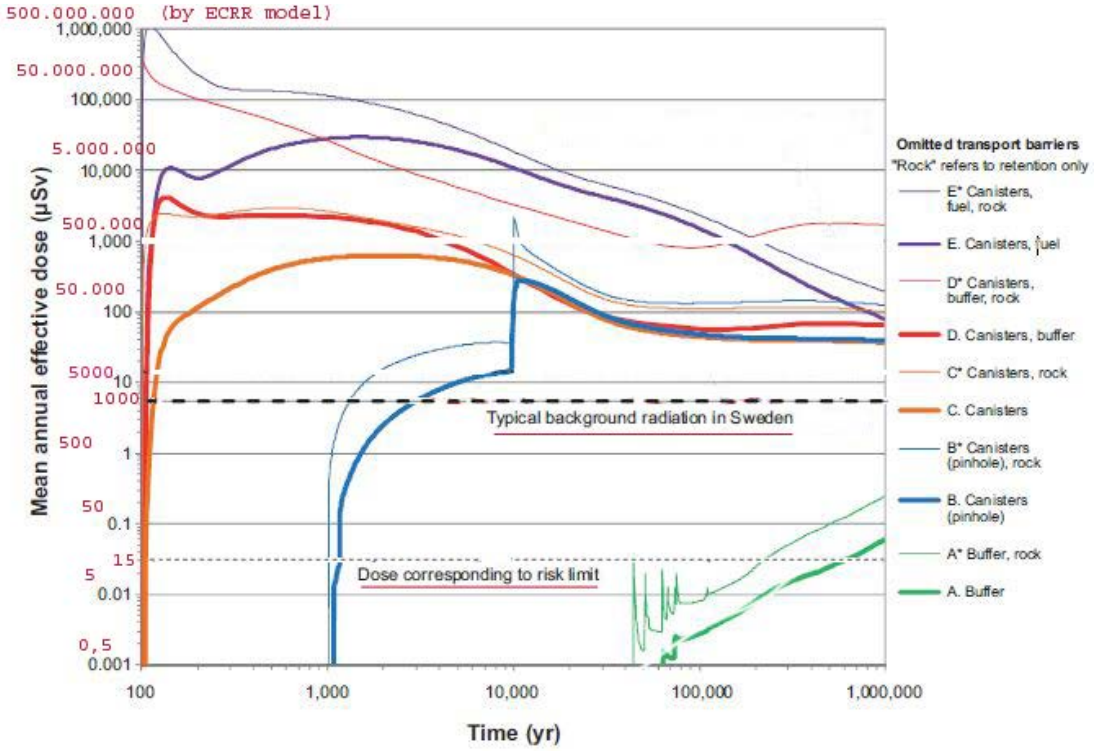

Figure S-12. Results of stylised cases to illustrate loss of barrier functions. Note that an omission of the "rock" barrier in these cases refers to omission of retention of radionuclides in the rock fractures only, whereas the favourable, low flow rate at repository depth and the favourable geochemical conditions are still taken into account. Y-Axis estimated Exposure by ECRR Model (www.euradcom.org)

6. The Selection Process for External Experts to Review the Forsmark Environmental Impact and Repository application.

The selection of external experts is a process which has a number of separate serious systemic flaws. We obtain the information on this process from having attended meeting in Stockholm on 22nd September 2011 where SSM presented the protocols and the timeline of the process of licensing for the project by the Swedish State. In addition to this, we have examined the document: *Specification: Consulting Services regarding the Swedish Radiation Safety Authority's review of the safety assessment methodology and consequence analysis in the SR-Site safety assessment for a spent fuel repository in Forsmark, Sweden SSM 2011/592.* Hereafter we will refer to this document and the process as **SCS.**

SCS represents a series of requirements to be fulfilled by those who are interested in acting as external experts. The SSM have broken down the review topic into the following 5 areas:

1. Key consultant for integration and coordination of the safety assessment methodology and consequence analysis
2. Quality Assurance Review
3. Independent modelling of radionuclide transport
4. Radionuclide Chemistry
5. Biosphere dose assessment

Within these 5 areas there were presented, at the SSM meeting in Stockholm, a wide range of expert areas some of which seemed rather tangential to the issue (e.g. womens' studies). However, what was clear there, and is clearer still on examining the SCS, is that a topic on "Radiation Risk Assessment" was missing. How is it that this expertise is not at the very core and top of the issues?

What is so extraordinary is this: **the main question about this project is *will it cause contamination of the environment which will harm health of 10 nations around the Baltic Sea?* Yet there is no properly structured external expertise team to review the case made by the SKB Forsmark application presenters that it will not.**
The closest that the SCS comes to this is to ask for an external expert to assess the Biosphere Dose. Note this assessment is not one of *the human dose,* but is the *biosphere dose.* And as we have described above, the dose is meaningless when it comes to internal exposure to the materials which will contaminate the area around and more remote from the installation. And the *biosphere dose* is a meaningless and scientifically indefinable concept. So this brings us to the first flaw in the process, the greatest and most fatal flaw.

6.1 Systematic bias: there is no external review of the ICRP radiation risk model on which the health effects consequence accounting of the proposed repository is based.

The assessment of health effects from the releases from the site under various assumptions of failure over various time scales is based on the ICRP risk model. This is *built in* to the whole process as a Black Box. The final output of all the calculations and models in SCS and the SKB application is an *absorbed dose.* Section 5 of the SCS asks for a review of the *Biosphere Dose*. It does not, as it should, ask for a review of the *Biosphere Health Consequences* or better, the *Human Health Consequences*. Who is interested in the Biosphere Dose? Who would even know what it meant? The *dose* and the *health consequences* are not the same thing, as we know from the study of Martin Tondel (section 4) where the dose was low but the cancer effects alarming and also in many other reports reviewed and cited in ECRR2010. The SSM are quite aware of this. We have spoken with them on several occasions and have provided risk model copies of both ECRR 2003 and ECRR2010. Pr C. Busby has drawn SSM's attention in letters, reports and face to face meetings to the enormous number of peer reviewed journal reports of research showing the ICRP model to be seriously unsafe for this purpose of assessing harm from internal exposures. The only member of SSM that seemed to be about to do anything about it was Dr Carl Magnus Larsson who was transformed to Australia shortly after our meeting and is still there.

It is criminally irresponsible of the SSM to fail to address this issue and to construct a review procedure which does not include this question even as part of a scoping

exercise. The UK Committee on Radioactive Waste management CoRWM paid for and consulted with ECRR and included in its final report a section where this issue of the uncertainties over the risk coefficients for certain internal radionuclides was presented. As CoRWM noted, and as the ECRR model shows, the most important radionuclide in this analysis is Uranium-238. The reason for this is that it has been shown by many research studies in the last 10 years that U-238 health effects are underestimated by a very large amount. This has to do with the strong chemical affinity of Uranium to DNA and its ability to concentrate gamma radiation into the DNA through secondary photoelectron enhancement. **The contamination of the Baltic Sea by U-238 is already a major issue since the substance has an enormous half life, some billions of years, a period which cannot by any calculation ensure the integrity of the waste site, whose main content by mass will be Uranium. The consideration of this issue by the Forsmark final repository EIS is specious and absolutely misleading.** The legacy of Uranium contamination that will be left to future generations will involve all the Uranium brought to Sweden from mines all over the world and eventualy effectively dumped into the Baltic Sea, already the most radioactively contaminated sea in the world.

So this is the first and most serious defect in SCS. It assumes incorrectly that the required output is *absorbed dose* when the required output is *health consequence*. It assumes that there is no question over the risk model SSM employs when there is an enormous question mark over it and massive and unequivocal evidence (that has been given to SSM and which SSM are aware of) that it is incorrect and unsafe for the very radioactive substances that the Forsmark repository will process and release to the environment.

The ICRP Scientific Secretary Emeritus Dr Jack Valentin has previously admitted himself that the ICRP model should not be used by the government to predict health consequences, that the uncertainties of the ICRP model are in an order of several magnitudes (http://youtu.be/k2JFxnAkTW4, http://youtu.be/lgP88WTK9y8).

6.2. Cultural bias: the external experts are chosen on a basis that will ensure that they are already part of a culture that believes deep disposal to be a reasonable option.

This is obviously a systematic fault which will effectually exclude all who disagree with the idea that process is viable. Examination of the SCS shows that to qualify, each expert will have to show that they have been the author or part author of reports or peer review papers which address deep disposal options for high level radioactive waste or a relevant aspect of it. It is clear that any such people will have been working on contracts for nuclear industry or State funded nuclear waste analytical groups. It is easy to see that if the recruitment document had stated that **none of the applicants should have been involved either directly or indirectly in work commissioned by SKB or POSIVA** (the Finnish outfit engaged in a similar exercise) for the last *ten years* rather than ***two years***, it would seriously reduce the number of applicants. And if this were extended from SKB and POSIVA **to all the other nuclear waste and nuclear power operators in Europe and the USA, (e.g. BNFL, NIREX, STUDSVIK, COGEMA**) the number of potential external experts would reduce to zero. In other words, ***all*** **the possible external experts are from a culture that profits from nuclear industry, and have been exercised only within the frame of the ICRP model**. Therefore they should all be blocked as culturally biased. Let no one think that scientists and technical experts are not biased by their culture and affiliations. There are entire research faculties addressing this issue (see e.g.

Latour 1981). The matter was studied in some depth by the EU Policy Information Network on Child Health and Environment PINCHE which concluded in its final reports, published in the peer review literature, that environmental expert scientists are biased by their affiliations and that **oppositional structures were the only way to discover the truth** (van den Hazel et al 2006). We return to this below.

6.3. Bias in reports: the experts have to have produced reports *or* peer reviewed papers in their area of expertise. Reports are not peer-reviewed by independent reviewers . There is lack of funding for the alternative type of reports.

The SCS requirement for consideration is that the expert shall be the author or co-author of at least one or two reports or published papers over the past five years addressing the relevant issues. The authorship or co-authorship of a report on the issue merely assures us that the expert has worked for some outfit that is paid to consider these issues. Such an outfit is almost certainly already part of the culture that regards deep disposal as a viable option for future nuclear industrial profits. No one will have paid for such a person to create a report which concludes that deep disposal is dangerous. The reports are not peer-reviewed by independent reviewers. The ICRP risk model reports are not peer-reviewed. The SSM reports are not peer-reviewed. These reports are written by in-house authors who can say anything they like. The result is a Report. But it may be a lot of nonsense, it may be wrong and frequently is. The ICRP reports are a case in point. They present a model for radiation and health and they cite studies in the peer review literature which support their model. They do not cite any studies that show their model to be wildly wrong. One of the authors of this ICRP report could present him or herself as an expert to the SSM, and be accepted on the basis of having been such an author. This would be a serious problem which would lead to incorrect advice.
A published paper (which is one option) may be peer reviewed but is almost always submitted to a journal where the reviewers are part of the same culture. Peer review by those opposing the idea would be a better option, but it is not a requirement of the SCS.

6.4. Bias in selection of expertise - selection of mathematical modellers at the expense of empirical and observational scientists and medical experts

There is no requirement in SCS for any experts on human health, no doctors, no epidemiologists, no oncologists, no radiation biologists, no specialists in genomic instability, no geneticists who have studied the effects of low doses of these substances on living systems and humans after Chernobyl. There is no shortage of such people, and one would think that their expertise might be of value since the project has the capacity under various scenarios to release very large amounts of radioactivity to the Baltic Sea and its coastal environment. This is apart from the general question of the risk model already considered.

The bias is in the selection of mathematical modellers at the expense of empirical and observational scientists and medical experts. This is not an accident. The way in which the nuclear industry and its allies operate is the way of the physicist and the mathematical modeller. The whole Forsmark project is one which is carried out with mathematical models. The risk model is a mathematical model, based on simplistic assumptions about humans modelled as bags of water into which energy is deposited. The environment is modelled as a series of differential equations and rate processes for transfer of substances though and across ideal modelled boundaries. The coefficients and

components of all these models are very uncertain. At one point in the SCS this is admitted. On page 19 under radionuclide chemistry we read:

This review topic shall address the quantification of such phenomena in SR-site covering both distribution coefficients (Kd values) and radionuclide solubility limits. The ***establishment of values for such parameters is expected to be done at least partially through expert judgement****.*

These *distribution coefficients (Kd values) and radionuclide solubility limits* are the basic inputs that define the output of the very large compartment transfer models whose output is eventually the amount of contamination that makes it into the Baltic Sea coast and its inhabitants. No one knows what they are and no one ever can know since the experiment has never been done. What is being done is that someone is being asked to **guess** at what these numbers are. But such **expert judgements** (guesses) will be based on single system experiments. No one has measured the solubility of Uranium in hot highly ionised water containing hydrogen peroxide from the radiolysis in the presence of high levels of ionising radiation, Caesium 137 and Strontium 90. Each number, each expert judgement, is part of a chain which accrues uncertainty, and the numbers are very small. Let us give an example involving five compartments (there are a lot more than 5 in this system and each has more than one assumed coefficient). Let us say that we have (1) transport from the cask (2) transport through the bentonite clay (3) transport through the ground (4) transport through the groundwater to the sea (5) dosimetric estimates. These are five sequential rate type processes. An error of an order of magnitude in the estimate of each of these will result in errors of five orders of magnitude (100,000-fold) in the output, the effect on living systems. Dr Rachel Western made this exact point at the NIREX deep depository enquiry and the project was (rightly) knocked on the head.

The extraction of reality into mathematics space is a phenomenon which is a favourite of physicists, and this century has seen increasing use of such methods. With the advent of fact computers, the modelling approach (now termed *in silico*) has expanded at the expense of the observational approach and its power is that it can provide almost any required answer with some degree of analytical justification. This does not, of course, ensure that it tells the truth or gives the correct answer. But it holds a dreadful fascination and packs a large philosophical punch since it can be said to be objective (logical positivism). It is, of course, not objective, since it depends on its inputs and chosen coefficients. Ordinary people and non scientists including most politicians do not realise this. If a mathematical model (like the ICRP model) gives an answer that disagrees with the observation, the model is wrong, not the observation. This is the curious looking – glass world situation we are in with the child leukaemia clusters near nuclear sites. The ICRP model shows they cannot be caused by radiation. The model of course is wrong.

6.5 SSM is locked within the structure of SKB´s application. This leads to many more problems:

6.5.1 The expert criteria bias is focused on the KBS3 solution proposed. It is the only final disposal method investigated, and SSM has already conducted two safety assessments of the SKB-3 method: it is thus arguably locked into a pre determined path. Alternative methods are neither properly explored nor properly presented in the SKB application so alternative experts to consider this issue will not be engaged

The various radiation safety directives, e.g. the EURATOM Basic Safety Standards Directive, which is EU law and to which Sweden is subject, requires that all projects involving potential exposure to ionising radiation must be justified and all exposures controlled to be as low as possible, the ALARA requirement. It is clear that the Forsmark proposal would at some time result in contamination of the environment and expose individuals and other creatures which inhabit the areas which would become contaminated. The SKB application concedes this. However, no serious part of the analysis by external experts includes the possibility of suggesting alternative ways of dealing with the radioactive waste whichmight produce lower exposures to individuals and no contamination of the wider environment. For example, it is clear that there is the alternative involving packaging the waste and dry storage in a mountain under conditions where the waste could be monitored and repackaged. If this alternative were considered, the contamination of the environment would be far lower than in the deep disposal option and the doses and effects on humans and biota would be negligible. This would of course be more costly, since it would involve maintaining such a storage site indefinitely, but this would only make starkly clear what is implicit in the nuclear energy option, and what should be part of the economic consideration of such an option, built-in to the electricity cost. This is the generation of vast quantities of dangerous genotoxic material with very long term hazardous properties that have to be safely dealt with. No expert is recruited, within the context of the External Expert review, to argue for alternative and safer solutions because the system is set up on the assumption that the Forsmark solution is the only one on the table. This is probably strictly illegal under the EURATOM legislation.

6.5.2. A separate expertise area on the choice of location. SKB´s bias in planning repository on the seashore locations possible- sea coastal area- for the contamination of the whole Baltic Sea Region. No other locations away from the sea are even optioned and described so the experts suggesting inland repository designs will be systemically excluded from the SKB application evaluation process.

The location of Repository was chosen through a biased process where one little municipality that is accustomed to dealing with radioactivity has approved to participate as a possible host in the process of preparation of a Final Nuclear Waste Repository . The actual SKB application to the Environmental Court does contain some reliable considerations of amounts of radioactivity contamination, as the figure S-12, in the SR-Site Summary TR-11-01, describing the mass-lethal amounts of 10.000- 1.000.000 μSv of annual effective dose as the consequence for the region possibly already within 200 years.

These estimations suggest the legacy of Uranium contamination that would be left to future generations would involve all the Uranium brought to Sweden from mines all over the world and eventually effectively dumped into the Baltic Sea, already the most radioactively contaminated sea in the world.

Obviously these prospects have not stopped SKB to apply for the permit to build repository on the seashore.

6.6 **Bias and dishonesty in decision makers within the current system**

Too often public health influencing public agencies are run by biased and dishonest decision makers who oversee the processes of the choice of experts in an unacceptable way. Two examples of such experts placed in influential positions who currently exert considerable biased influence on the system of radiation protection will follow here. The first is Lars Erik Holm, former Medical Officer of Health for Sweden, who has previously also held the most senior positions in national and international agencies providing advice on radiation risk. It is clear from all the evidence we provide in the attachment that Dr Holm has been accused of being either a dishonest or an incompetent scientist. Holm was currently a decision maker in Sweden and internationally. An example of his influence is when he stopped the research of Martin Tondel who had demonstrated significant cancer increases in northern Sweden from the Chernobyl fallout. More recently he was placed as an expert advising the Japanese on the health effects of the Fukushima exposures. His position was that there were no increases in cancer after Chernobyl and there will be no increases in cancer after Fukushima. Ironically, Holm has recently spoken on Swedish Radio calling for transparency in presenting data about the Japanese disaster. Holm didn't get disbarred from his position of authority on health in Sweden because of conflict of interest, but but still should be investigated for scientific dishonesty.

The second individual we present is Dr Richard Wakeford, also as we argue a dishonest scientist who could quite easily be selected as an expert in the Forsmark case since he left his position with the nuclear industry more than two years ago and is now falsely presenting himself as an independent scientist in a number of committees in Europe and the UK. The cases against both these individuals are given in the attached appendix.

Are the managers at SSM non biased and honest decision makers? Who is watching the watchers?

7. What is to be done?

The way in which the SKB Forsmark project is being developed is unjust and strictly illegal within the context of the various Human Rights and the Environment conventions and Declarations outlined in Section 2. The reasons for this injustice are outlined above, and taken together or individually represent a fatal criticism of the process being organised by SSM. The resolution of this problem must involve a reappraisal of the process itself and a re-examination of the risk model upon which the development is based. The reviews of the SKB EIS and supporting analyses should be opened formally within the context of the development process to independent review by a balancing amount of scientists and experts who are from outside the cosy group which are defined by the requirements laid down by SSM.

In areas of uncertainty in scientific advice relating to policies involving possible environmental harm, the PINCHE group of scientists, toxicologists, epidemiologists and doctors recommended in their final report to the European Commission and in their peer reviewed publications that it should be accepted at the outset of any advisory process that expert advice was biased by the affiliations and historical culture of the connections each expert carried (Van den Hazel et al 2006). Since this was so, the only way to obtain the best advice was to set up an oppositional culture where experts from each side of any argument would provide their take on the situation being discussed. Such a process would have prevented the Mad Cow Disease episodes of the late 180s and early 1990s which

resulted in bad advice being given to government and many human deaths occurring. The oppositional committees must be set up in such a way that there is complete transparency and each side in the argument over the effects of the particular policy change on the environment must be permitted to write their side of the case with their evidence in any report which is created at the end of the process. **In the SCS approach to the Forsmark proposals, the matter would be simply resolved by bringing in a team of truly independent scientists and experts outside the scope of nuclear industrial complex to address the most relevant issues in the Final Nuclear Waste Repository subject.**

This is Best Practice for correcting bias and obtaining accurate scientific advice at the science policy interface suggested by the EU PINCHE scientific expert group (van den Hazel et al 2006).

ECRR requests substantial sources of funding for processes of independent scientific scrutiny

ECRR requests an urgent solution of the currently dangerous situation of absence of an independent scientific process for the eventually apocalyptic project of the Forsmark SNFWFR with existential risk levels for all Baltic Sea Region countries. We demand establishment of substantial source of funding for independent scientific scrutiny of the The Forsmark Spent Nuclear Fuel Waste Final Repository **(**SNFWFR) projects.
ECRR suggests the Swedish Environment Agency to provide substantial funding for independent scientific scrutiny of the Forsmark Spent Nuclear Fuel Waste Final Repository that could be managed by the Agency itself, issuing public hearings on the issue of who are the expert scientists to be financed, as no other official parties can be found unbiased.

The Swedish Environmental Protection Agency is directed to the advice to the European Commission given by the PINCHE Committee of the 40 eminent specialists, scientists and doctors that made up the PINCHE policy network 3.7.3 Obtaining scientific advice (Page 24, PINCHE Workpackage 6, Science and Policy Interface).

Section 3.7.1 report of the final PINCHE report states:
On the collection and use of expertise by the Commission: principles and guidelines – improving the knowledge base for better policies (5), such as transparency and pluralism, the present system clearly fails in many of these areas. The problems that have led to such a situation have been discussed. The question is how to proceed. First, better scientific advice must be obtained, from research that can be believed to be unbiased and interpreted by experts who are themselves unbiased and then distilled into some kind of advice policy-makers can understand. The public, or its representatives, need to be involved at some level, and the whole process has to be transparent at each stage so that if something goes wrong, the decision that was incorrect can be identified. The reliance on expert committees, such as in the United Kingdom, does not take into consideration the built-in bias of the committee selection processes and cultures. Since this system of advice is intrinsically "political" in that sense and since it can be argued that there is no such person as an unbiased scientist (because all scientists have beliefs), a suitable way forward would be to acknowledge this within the structure of the scientific advice process.

A proposal is suggested for an oppositional or discursive committee. This system would be similar with the legal system. Discussion or argument might not be needed; however, if it is, then the committee would include scientists whose job and remit was to oppose the proposal being advanced and to find all the evidence supporting this position. Such

scientists would be funded by government, or the EU. Their activities and reports to the oppositional committee, like those of the proponents of the process, would be accessible to review and placed on the Internet so that, if they had missed anything or if their opposition was incorrect or corrupt, this could be identified. Direct public involvement or representation is needed in the process of oppositional committees or even regular committees.

Furthermore the openness of the process to the scrutiny of various public bodies and environmental organisations should remain throughout the final planning and construction of the repository, should that decision be taken. All 10 countries around the Baltic Sea should be properly informed and protected acquiring decisions of the wise indigenous priests and elders who emit local money to provide funding to generate independent research that will save future of all living systems. By no means decisions on final disposal of most radioactive substances can be made by currently involved scientifically and administratively disinformed structures that haven´t even passed the tests of being loyal to the native people of the region.

We establish the new level of independent expertise for the safety of inhabitants of the whole Baltic Sea Region to solve the waste problem solutions. We finance it through currency Baltic IR that indigenous peoples emit themselves in the amounts necessary to obtain the goals of sustainable self-managed environment that is safe for the future generations.

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