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Attention: Mr. R. M. Longden-Thurgood

**ESKOM ENVIRONMENTAL IMPACT ASSESSMENT (EIA:12/12/20/944) FOR A PROPOSED NUCLEAR POWER STATION AND ASSOCIATED INFRASTRUCTURE: COMMENTS ON THE REVISED PLAN OF STUDY FOR EIA**

Your correspondence to Ms. Bongi Shinga of Acer (Africa) entitled *"Comment on the Nuclear-1 Draft EIR"* refers.

Arcus GIBB acknowledges receipt of the above-mentioned letter. We thank you for your valuable comments and your participation in the Eskom Nuclear Power Station (NPS) Environmental Impact Assessment (EIA) process to date. Your questions and comments concerning the Nuclear-1 have been noted.

Responses to your comments / questions are as follows:

Your comment (1)

P.2 1st paragraph: a very important aspect to deal with, first, in order to reach the operational stage is commissioning. And after decommissioning comes the final dismantling stage. These stages therefore need to be included: " - - - proposes to construct, commission, operate, decommission and dismantle - - - ". It is to be noted that the DEA in its document concerning the agreement reached with the NNR, in the second paragraph on p.3 is also leaves out both commissioning and dismantling - see my comments to Appendix 2 below.

IT IS RECOMMENDED that the unfortunate omission of the vital commissioning phase, and the dismantling phase, are raised both with the NNR and the DEA.

Response (1)

Your comment is noted. The addition of the words 'commissioning' and 'dismantling' to the sentence will be put forward to the drafters of the Environmental Impact Report (EIR) for their consideration. Commissioning and decommissioning of the Nuclear Power Station is described in Chapter 3 of the Draft Environmental Impact Assessment Report (Draft EIR). Dismantling of the power station is described as part of section 3.21 of Chapter 3.

Your comment (2)

P.6 Fresh water supply: if there is any local underground aquifer leading to the sea, could the massive below-ground works for two or three nuclear reactors block off the run-off, leading to winter

flooding? No doubt the specialist's report deals with this aspect. Any such possibility could, of course, even enhance any wetlands -Impacts on wetlands refers.

Response (2)

The Geohydrology Assessment attached as Appendix E8 to the Draft EIR states that the impact rating of the potential environmental impacts is summarised as follows for the construction and operational phases:

- Flooding by groundwater: Low at all three sites without mitigation and very low with mitigation; and
- Depletion of local aquifers: Low at all three site without mitigation and very low with mitigation.

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Your comment (3)

P.8 Oceanographic impacts: the first para says that "Although the major infrastructure for Nuclear-1 will be built at least 10 m above sea level, - - - ", does this mean that the bedrock at sandy sites - eg Koeberg - is 10 metres *above* sea level? And, therefore, that the main support basements for the two Koeberg reactor containment buildings *don't go below sea level*? Again, I assume that the specialist's report deals with this aspect.

Response (3)

The Geotechnical Assessment attached as Appendix E5 to the Draft EIR gives the following description of the bedrock conditions at the sites:

Thyspunt
The rock terrace underlying the soil overburden at Thyspunt is a wave cut platform, previously subjected to erosion by the sea. The bedrock level is at (or just above) mean sea level from the sea to approximately 1 km inland. There then appears to be a gradual rise in bedrock level to approximately 60 mamsl about 2.5 km inland. The rock terrace is therefore consistently at (or just above) mean sea level within the project focus area.

Bantamsklip
The rock terrace at Bantamsklip is at mean sea level at the sea and rises gradually to approximately 10 mamsl about 1 km inland. The rock terrace is therefore consistently at (or just above) mean sea level within the project area.

Duynefontein
The rock terrace at Duynefontein is consistently at -10 mamsl. This is a regional feature and therefore applies to the project area.

Your comment (4)

P.8 Economic impact assessment: whichever PWR type is selected, the Areva EPR or Westing-house AP1000, will there be aspects of the construction of the secondary systems which would justify the establishment of a major industry in Atlantis? This town is well located for supplying to all of the five projected nuclear sites. Would local industry involvement not have a positive economic impact?

What worries me about this summary is that it would appear that the only economic aspect which has been considered relates purely to the location logistics - which site will cost Eskom the minimum sum for it development?

Response (4)

The Social Impact Assessment attached as Appendix E18 to the Draft EIR notes that a significant number of business opportunities will be created for local companies / service providers and SMME's.

It further recommends that the utilisation of local suppliers and service providers must be promoted through local procurement and pro-active targeting processes via an open and transparent tender process for all construction related activities.

Your comment (5)

P.9 Social impact: isn't one of the social impacts the possibility of starting up businesses to manufacture parts and components for the PWR secondary systems? (See comment above for the Economic impact assessment)

Response (5)

See comment response 4 above.

Your comment (6)

P.10 Noise impacts: reference is made to an OCGT plant at Thyspunt as a future development. What will be the purpose of this plant at Thyspunt that it isn't required at the other three sites - ie not including Koeberg as there is an OCGT plant at Atlantis. And because a CCGT power plant is more efficient that a CCGT plant, why is the former not being considered, for whatever reason it is required (only?) at Thyspunt?

Hopefully these questions have been answered in the specialist's report

Response (6)

Your comment (7)

P.10 Selection of site alternative: quoting from the 4th para on this page - "The Bantamsklip alternative would be costly because its location would require longer and larger transmission lines than either of the other two sites (900 km of combined 765 kV and 400 kV transmission lines at Bantamsklip vs. 500 km and 190 km of 400 kV lines at Thyspunt and Duynefontein respect-tively)".

Why should the construction of a 765 kV line only apply to Bantamsklip and not to the other two sites? That means transformers to raise the voltage to 765 kV would only be included if and when the Bantamsklip site is selected. Why the difference, considering that 765 kV lines across the country are being considered (the EIA processes for which are currently on-going). If 765 kV is going to be the standard voltage for transmission purposes from the power stations in Mpuma-langa and Gauteng to the Western Cape, what is the justification for not insisting that all of the projected new PWR power stations provide supplies into the grid at 765 kV? Something is surely being missed, here, despite the fact of Bantamsklip being removed for consideration in this specific Nuclear-1 EIA process.

Response (7)

The construction of 765kV lines to the Bantamsklip site is required because of the distance from both the nearest load centre and the existing main 765kV backbone infrastructure. As there is no large load centre close to the Bantamsklip site essentially all the generated power has to be exported out of the

area over a long distance which is more efficient at the higher voltage and requires fewer lines than at 400kV. The voltage and number of lines in the case of Bantamsklip is mainly determined by the dynamic stability criterion which requires the power station generators to remain stable and synchronized after the loss of two transmission lines as the 765kV lines are much “stronger” electrically than the 400kV lines.

In the case of the Duynefontein site there is a significant load centre in the Cape Town area and the termination of the new 765kV backbone infrastructure extension is less than 40km from the site. Thus the generated power has a short distance to be transferred to the load and any excess power during low load can be exported out of the Cape Town area via the 765kV backbone. Therefore the connection can be done at 400kV because of the distance from the site to the 765kV termination point and from the Cape Town load network. Similarly for the Thyspunt site there is a relatively large and growing load centre in the Port Elizabeth area and the 765kV backbone infrastructure will also soon be extended down to the Coega development area, thus providing an existing 765kV point to connect to. The distance to the Thyspunt site is less than 130km which means it can be connected at 400kV as at this distance the 400kV voltage is “strong” enough to maintain dynamic stability after contingencies. It also has the advantage of being able to mesh with 400kV network to supply new local 400kV substations required to meet the growing demand in the Port Elizabeth area.

The selection of 765kV for the Bantamsklip site and 400kV for the other two sites is a function of the location, the existing and future transmission infrastructure and of the distance to the main load centers (existing and future). The final integration of any power station must be able to meet the South African Grid Code requirements and allow the safe and stable operation of the power system as a whole.

Your comment (8)

P.12 Forms of power generation: as a general statement (at least as worded here) is this really true - "As far as power generation technologies are concerned, nuclear generation and coal-fired power generation are the only proven base-load technologies"?

Although hydropower in South Africa is a problem because of lack of large rivers, and wind power is utterly hopeless for base-load supply purposes, won’t solar concentrating power pro-vide a useful base-load capability?

Response (8)

In terms of alternatives to meeting the present energy demand, given the state of present technology, renewable energy sources are not yet in a position to replace base stations. However, nuclear power is a relatively clean source if compared to other base options. Thus, as far as power generation technologies are concerned, nuclear generation and coal-fired power generation are the only proven base-load technologies. Of these two, coal-fired generation is not viable in the coastal regions of the Western Cape and Eastern Cape. Apart from these factors, South Africa must make increasing use of nuclear power generation in future to reduce its greenhouse gas emissions in order to comply with its commitments made at the Copenhagen Climate Change Summit in December 2009. The life cycle contributions of nuclear electricity generation to greenhouse gas emissions is small compared to coal-fired electricity generation. This points to Nuclear generated electricity being a necessary part of South Africa’s strategy to generate an additional 40 000 MW of electricity by 2025.

Your comment (9)

P.12 Nuclear plant types: this says - "The existing Koeberg nuclear power station uses PWR technology and it is therefore a tested form of power generation that has been operating safely for the past 24 years".

This is a very strangely worded comment. PWRs are not a tested form of power generation *per se* because they have been in use at Koeberg for 24 years, but because there are now 10 000's of reactor-years experience in their operation, worldwide! The fact that Eskom now has 24 years experience in the operation of these PWRs is a rather different issue. The comment should, therefore, be changed in order to maintain the proper professional status of this draft EIR.

Response (9)

Your comment is noted and will be referred to the authors of the report for consideration. Rephrase "The existing Koeberg nuclear power station which has been in operation for the past 24 years, utilises the PWR technology which is a tested form of power generation with 10000's of operating experience". According to the World Nuclear association there is 14145 reactor-years of worldwide experience in producing civil nuclear power.

Your comment (10)

P.12 Modes of transport: quoting from the first para - " - - - transport by barge from Cape Town harbour has been suggested as an alternative to road transport". Later it mentions necessary facilities would have to be constructed in order to lift and offload plant and equipment from a barge, and then transport it to the site. Would not such facilities add considerable expense to locating at Bantamsklip, with all the necessary work for a separate EIA process?

All this work would still be necessary in the future if Bantamsklip was ever to be selected for a later nuclear project. It all depends on how many reactors are going to be required to provide the projected 20 000 MW generating capacity. My considered opinion is that, in fact, Bantamsklip may never be selected.

Response (10)

Your comment is noted. Chapter 9 of the Draft EIR further states that A power station at Bantamsklip would be less advantageous, as 765 kV transmission lines would be required through difficult terrain, which would result in substantial additional cost at the Bantamsklip site. In summary, development of a power station in the Eastern Cape would result in substantial improvement in system adequacy and supply security due to a better "generation to load balance" in the local area, as it has no base-load generating capacity.

Your comment (11)

Final comments: I assume that somewhere information will be provided on what PWR Eskom intends to have constructed for Nuclear-1. At the moment, despite assurances from Westing-house that the new concept for the AP1000's allegedly reinforced containment building will sur-vive a direct hit by a Boeing 747, both the US NRC and the UK HSE Nuclear Safety Branch have expressed considerable doubts about it, and both require some form of demonstration of its integrity. And where the Areva EPR is concerned, questions need to be asked why the first of class under construction at Olkiluoto, Finland, has run into such a gross cost over-run.

Response (11)

Eskom has not decided on a preferred supplier for Nuclear-1 and the, detailed descriptions of the proposed plant are not yet available. Upon plant selection, due diligence will be done with respect to safety (including air craft crash) integrity of the design.

Your comment (12)

I have also just read (14/03/2010) about another claimed problem with the EPR, namely that it's not able to load-follow because of some specific aspect of its safety systems. It is stated that this capability is very important when electricity is being fed into the grid from inconsistently stable so-called "renewable" sources, primarily wind generated power. Areva are claiming that they will deal with this problem.

Response (12)

Your comments on the Final Plan of Study for the EIA process are noted. The Final Plan of Study was however approved by the Department of Environmental Affairs in January of 2010.

Your comment (13)

FINAL PLAN OF STUDY (FPoS) FOR THIS EIA PROCESS

Section 4.2 Impact Assessment Methodology: this section in fact deals with the *environmental* impact of the project, not to impacts of large solid bodies with a containment building. (See under Final comments above). The title, therefore, should be changed to Environmental Impact Assessment Methodology. I assume that the criteria to be fulfilled in the event of large bodies impacting a containment building will be dealt with by the NNR.

FPoS APPENDIX 1

This comment in the DEAT's letter is very significant - "2.14.2 There is a missing ink between the National Policy on Nuclear Energy and the EIA document. This creates the impression that the use of nuclear is open for discussion. This must be clarified in the EIR".

It's a point which I had missed. It is most important that the National Policy on nuclear power is not challenged for this EIA process. However, it *is* relevant to raise it directly with the DEA. *[Please note that there's something strange with this document because I am unable to highlight, copy and paste from it]*

2.15.1 says: "The proposed technology alternatives discussed in the SR must be assessed taking into consideration their environmental performance".

Radiological environmental issues have been excluded, as this quote confirms: "*Legislation and Guidelines* 2.21 - All radiological issues raised during the EIA process, which are not comprehensively addressed, must be explicitly referred to the NNR to be addressed as part of their process".

The implication would be that the NNR must have at least one representative in attendance at all Key Stakeholders and public meetings. Is this being achieved? The NNR should provide their address / e-mail address or whatever contact mechanism for this EIA process is appropriate. People are going to want to raise radiation / nuclear safety issues during the EIA public mee-tings, and it is quite inadequate to tell those people that they should contact the NNR. The public needs to be given an unequivocal means of contacting the appropriate individual in the NNR, and whose terms of reference need to be clearly established for responding to queries submitted by the public and not to ignore them - *vide* comments below for the submission by the PWG.

Radiological issues are always going to be a prime consideration of the public where nuclear power is concerned. These are going to be raised during all Key Stakeholders and public meetings for this EIA process. The facilitator needs to have the NNR contact informa-tion available in order to be able to

provide constructive responses to those members of the public asking questions about nuclear and radiation safety.

Response (13)

Comment noted. The NNR public participation process will address issues of nuclear safety.

Your comment (14)

FPoS APPENDIX 2

P.3 second paragraph - this reads "Similarly in terms of Section 20(1) of the National Nuclear Regulator Act, Act No.47 of 1999 (NNRA), no person may site, construct, operate, decontaminate or decommission a nuclear installation - - - ". The omission of the commissioning phase is par-ticularly unfortunate for a nuclear plant because commissioning is a vital procedure which has to be rigorously carried out before any operational phase can be permitted to be started. A check needs to be made with the NNRA 2006 Regulations to see if the DEA has misquoted from it. But if the NNRA does actually omit mention of the commissioning phase, then these Regulations will required an urgent intervention by the Department of Energy to amend it.

Response (14)

Section 20 (1) of the NNRA does states that No person may site, construct, operate, decontaminate or decommission a nuclear installation except under the authority of a nuclear installation license. In addition section 21 (1) of the NNRA states that Any person wishing to site, construct, operate, decontaminate or decommission a nuclear installation may apply in the prescribed format to the chief executive officer for a nuclear installation licence and must furnish such information as the board requires.

Your comment (15)

FPoS APPENDIX 3 - RESPONSES

ITEM 1b City of Cape Town, Minutes of a meeting of the Executive Mayor and members of the Mayoral Committee, dated 22/07/2009 - All these comments are to be related to the NNR's responsibilities where this Eskom project is concerned, and not specifically to this EIA process. This has been made clear in the Response to the CoCT - *qv* - for which purpose the NNR's safety report is also subject to public participation and comment. Refer to the NNRA Regulations on Safety Standards and Regulatory Practices, Regulation No. R388, 23/04/2006. The minutes of the CoCT's discussion on this subject are dated 22/07/2009, long postdating the NNRA Regulations. The CoCT's Legal Department have been less than professional in apparently not being aware of these regulations, and they should have warned the meeting chairman in advance that this par-ticular discussion was quite irrelevant to this actual EIA process *per se*, but that it should be raised when the NNR's safety assessment document becomes available for public comment. Blaming the EIA process and, by implication, it's facilitators, for alleged deficiencies was, in the circumstances, quite out of order. The response from Arcus Gibb was to provide the relevant DEAT covering letter together with the DEAT DG's statement, dated 30/01/2009.

Obviously this comment of mine isn't intended to deny in any way the facility for the CoCT to be a participant in this EIA process, but that the two issues, environmental and nuclear safety, need to be dealt with independently and, therefore, they must not be confused.

Response (15)

Comment noted.

Your comment (16)

ITEM 2a Comments from the Pelindaba Working Group Note that the references given in blue at the head of this document presumably were attached to the document which was originally e-mailed to Arcus Gibb. It should have been possible to open them up from the websites. However, having converted the document to an Adobe Acrobat format, this cannot be done, or at least as opened up from the CD Rom. Could these references either be separately e-mailed to me in a format that I can open them up or, alternatively, let me have their respective urls which I can then copy and paste.

Response (16)

The references will be forwarded to yourself.

Your comment (17)

Ditto, 3rd para on p.3 It is curious that the PWG don't seem to appreciate that international standards are accepted by the government. The NEMA's precautionary principle will have been well taken care of when the international standards were developed, especially if South Africa had any input in the preparation of these standards.

It is arguably unfortunate for the self-proclaimed Pelindaba Working Group - sponsored by whom and for what purpose - that they can't get the names of the IAEA and ICRP correct. The first is *International Atomic Energy Agency*, and the second the *International Commission on Radio-logical Protection*. If they can't get such simple names correct, what is there to say about their other comments?

Response (17)

Comment noted.

Your comment (18)

Ditto, Comment (10), quoting - "No dose of man-made ionizing radiation is a safe dose, and there are numerous expert reports that back this statement and are widely available. Any negative nuclear related health impacts at any stage of this development is unacceptable risk. It would be of national value if the DEAT were to investigate this issue, along with the Department of Health rather than leave the discretion of the extent the Nuclear industry may poison civilians. (Please refer to the resources listed, Ref.2)".

This comment is patently untrue. The types of ionizing radiations arising naturally, and those of man-made origin, are identical, with the exception of neutrons which are rarely found in the natural background radiation. The authors don't seem to have much faith in the fact that, throughout the process of evolution, all plants and animals, including *homo sapiens*, evolved through that background radiation continuum. There have been experiments carried out on animals bred under conditions of very thick lead shielding which were found to be less healthy than controls bred under normal environmental conditions, ie exposed to the full intensity of the natural radiation background. I don't have any references to this research work to hand, but there were reports of such experiments at least 20 to 25 years ago.

Ionizing radiations *per se*, whether from external sources or internal sources, do not "poison" people. Depending on the intensity of the external radiation, they can either lead to cancers many years after

low intensity exposures have occurred, or to extreme tissue damage following intense exposure, causing death by the massive disruption Your of cellular tissue. In this latter case, it's the tissue breakdown products which are poisonous, in that their massive amounts produced in the blood and body fluids overwhelm the capacity of the normal body processes to remove such levels of waste materials and excrete them.

The effect of massive intakes of a radioactive nuclide (in soluble form) will depend on the intake; the ionizing radiations which are emitted in the decay process; the half life of the radionuclide; and the rate at which normal body processes are able to excrete the radionuclide. To take two examples: a minute intake of the very short half life Po-210 will rapidly cause death in a few weeks through cellular tissue damage before any poisonous effects become noticeable. In the case of the very long half life natural and depleted uranium, poisoning effects will become noticeable long before there are any consequences from the very low emission of ionizing radia-tions.

Response (18)

Comment noted. In addition nuclear power plants are designed with the concept of using multiple barriers to prevent radioactivity from escaping into the environment. The fuel is surrounded by a layer of cladding to confine the fission fragments emitted near the surface of the fuel (the fuel pellets are inserted into hollow metal tubes of stainless steel or Zircaloy). The primary system which is closed system is the second barrier that carries coolant water. The third barrier is the containment structure which houses the reactor is normally made of reinforced concrete with steel liner.

Your comment (19)

Ditto Comment (12), quoting - "The NNR is widely perceived as not having lived up to its mandate, almost never responds to queries from the public - - - ".

The comment about being tardy in responding to queries is largely correct. If the NNR manage-ment are happy to give the impression that they are an organisation totally above the law, and are happy to emulate Julius Malema Esq, and others, in this respect, then perhaps they might like to give some thought to the fact that the 2006 NNRA Regulations require public participation in the discussion on their nuclear safety documentation when it becomes available. Or will they be happy to ignore this aspect of their respon-sibilities?

This parallel public contact with the NNR on an *ad hoc* basis should be another item for inclusion in the NNRA Regulations.

Response (19)

Comment noted.

Your comment (20)

Ditto Response (13), quoting - "The background radiation that someone living in Cape Town is exposed to is 2 000 microSieverts a year. People living in Gauteng and Mpumalanga are exposed to 3 100 microSieverts a year due to the altitude and less screening of solar radiation".

There is also more uranium in surface soils in Gauteng and Mpumalanga than in the sandy soils of the Western Cape. It would be interesting to have the response of the PWG to this quite substantial increase in background at the higher altitude. Thus are people up in Gauteng more susceptible to getting cancers through ionizing radiations than those in the Western Cape who might just possibly receive the balance from 2 000 µSieverts per year due to a small release of radioactivity from the existing and new reactors?

Ditto Comment (18), quoting - "The impact of decommissioning on climate change and on sus-tainability issues must be considered".

This is a very curious point to raise. Could anyone really believe that the infinitely small impact of decommissioning (and dismantling) nuclear reactor plants would have any impact on *world* climate? Exactly what vector(s) would impose such an influence?

Ditto, Comment (19) - the idea that a the fuel cycle "from cradle to grave" is ever likely to arise in the way that the PWG envisages ever fades into the background. Nuclear fuel isn't in unlimited supply: the ores will eventually be worked out although, of course, there's still the more abun-dant thorium. However, it is much more likely that the uranium and transuranics will be separated and used as fuel in Gen-IV fast reactors. In the long term that should leave just fission products and activated reactor hardware to put into safe storage.

Response (20)

Comment noted.

Your comment (21)

Ditto, Comment (22) - I don't know whether the PWG has any representatives who live and work in the Western Cape, but they have some curious ideas if there's anything exceptional to be questioned relating to "hiding the truth about Koeberg". The PWG would appear to be totally unaware that there's an active Koeberg Public Safety Information Forum - KPSIF - established by legislation, which meets generally bi-monthly. Any member of the public can attend, and submit questions to Koeberg and NNR staff which, if not answered on the spot, will be at the next meeting.

Also this following requirement which the PWG demands would seen to be a strangely irrelevant require-ment for an EIA process relating to nuclear plants which will be constructed at a site yet to be selected along the Western Cape coast - quoting: "This report must also include informa-tion held by operators of both Koeberg and Pelindaba about abnormalities found on- or near-site in fish, reptiles and mammals, *and in the case of Pelindaba a clear account of massive bird and otter deaths on the Crocodile River in the 1990s*". [My italics].

Where does Pelindaba fit into the Nuclear-1 EIA process? We thus reach a point where such irrelevant requests seriously dent the credibility of the PWG's thesis.

Response (21)

Comment noted.

Your comment (22)

Ditto, Comment (23) - the awful scenario of the high incidence of breast cancers in the women living in the vicinity of the now shut down reactors at Trawsfynydd doesn't make any mention of what their incidence was before the reactors went operational. It is so easy to relate a high inci-dence of some health vector to demonstrate an aspect which suits one's personal viewpoint, without making any proper comparison with all the information which should have been available from the health records of the population.

Response (22)

Comment noted.

Your comment (23)

Ditto, Comment (29), quoting - "Nuclear energy is NOT sustainable, safe, and renewable. It is not clean, green or the answer to global warming. Nuclear waste is *[sic]* CANNOT “recycled” *[sic]* – it is “reprocessed” to produce far more deadly material which in turn has massive implications for nuclear proliferation".

This sentence demonstrates the lack of knowledge of the group. In recycling, the radioactivity of the subsequent products is broadly divided into three categories: fission products; uranium at whatever is its residual enrichment or depletion, ie compared with natural uranium; and the transuranics, including plutonium 239. However, as I have already mentioned, the uranium and transuranics can be used in Gen.IV fast breeder reactors in such a way that they more or less end up as fission products. Not quite, however, because there's invariably some residual fissile material left even at the end of the useful cycle of the fuel. But the important aspect about this use of the residual fuel is that the transuranics, including the plutonium, are not required to be separated: they can be used in their own right as a mixture for the fuel.

Response (23)

Comment noted.

Your comment (23)

Finally, in the list of urls for references, it would be interesting to know the ratio between articles, reports, etc, which attempt to demonstrate the disadvantages of nuclear power with those that provide information to support the opposite viewpoint. It is so very convenient to ignore the latter.

ITEM 3 Responses to the Strandvelt Tourism and Conservancy Association (STCA): this comment sounds rather interesting - "In our comments on the Final Scoping Report we point out that the plan to generate electricity along the Cape coast for the purpose of exporting [ie trans-mitting] it to the economic heartland of the country is preposterous".

Preposterous or not, how do the members of the STCA believe that additional supplies are provided to the Western Cape, now, over and above the capacity of the two Koeberg PWRs? This question requires no answer.

In South Africa, it would be quite irresponsible to locate any nuclear reactors inland because of the sparcity of cooling water supplies. Therefore the sea is the only alternative cooling source, as has been demonstrated for the past 24 years at Koeberg. In addition, using sites along the south and west coast ensures that relatively cool seawater is being used in contrast, for example, to those parts of the east coast which adjoin the warm Indian Ocean.

Furthermore, more generating capacity along the south coast will ensure that both the new Coega harbour and developing industrial complex will have adequate electricity supplies, as well as the major industrial city of Port Elizabeth. Commercial and industrial developments require electricity supplies; relatively nearby generating capacities better ensure the transmission of those supplies from its source to the user. Johannesburg, Durban and Richards Bay are not the only developing hubs in South Africa. The STCA appear to have a very myopic view of where the major developing hubs are to be found in South Africa.

The matter of supplies over long distances, with the resulting loss of power, is to be partly alle-viated by using a transmission voltage of 765 kV rather than 400 kV as at present.

These objections of the STCA therefore fall away as being unhelpful and rather meaningless.

Response (24)

Comment noted.

Your comment (25)

Ditto, Comment (4), quoting from the 2nd paragraph on p.5 - "■ a request for public comments on the terms of reference for specialist studies after these studies have already commenced and some of them are almost completed is completely irregular and makes a mockery of the EIA process".

I wonder what makes the STCA believe that an EIA process is so inflexible that it can't accommodate alterations or additions to the specialist reports at all stages prior to the Final EIR being sent to the DEA in this case? Of course, if their tactic is to deliberately apply delaying tactics in the basis that they are against nuclear power in South Africa, their curious comment can be better appreciated. As is mentioned in the response, all the concerns which I&APs might have had should have been provided at the draft scoping phase. I&APs, including the STCA, have the facility to comment on both on this document and the Draft EIR. The latter will provide the first opportunity for the specialists' reports to be presented to I&APs for comment.

Response (25)

Comment noted.

Your comment (26)

Ditto, quoting from the 2nd paragraph on p.10 - "We accept that for the generation of base load electricity the choices at this stage of international technological development are really only between coal, gas, nuclear and hydro".

There is very little hydropower which can be exploited in South Africa which hasn't already been done. One further technology which the STCA have omitted for base load generating capacity is solar concentrating. However, in common with nuclear power, it's relatively expensive.

Ditto, quoting from the 2nd paragraph on p.14 - "Eskom's decision to discontinue with comer- cial negotiations with possible vendors stopped the process dead in its tracks. If the DME or any other government agency or even Eskom where to pick up the ball again and start the process afresh to obtain quotes for the technology and construction of a nuclear power station, the time involved to get to the point at which Eskom was when their Board decided to discontinue negotiations, will probably be one or two years".

Obviously the STCA haven't kept themselves properly informed of the unfortunately unhelpful decisions made by the top Eskom management. Recent changes in the Eskom CEO should gave a clue to the problems that have arisen.

Response (26)

Comment noted.

Your comment (27)

ITEM 6 Comments from Ninette Potgieter - there seems to be some strange idea that decom- missioning is going to be a problem - in a *minimum* of 60 years time! About half of the 400 odd PWRs in the world have already been shut down, now, and decommissioned. In the interim 60 years, hundreds more PWRs will be decommissioned. And, during that time, experience will also have accumulated on dealing efficiently with the final dismantling process.

In the decommissioning phase, everything which it is radiologically safe to dismantle in a reactor installation will be removed, including the removal of the spent fuel elements to the spent fuel pool store. The highly active control rods will also be removed and placed in special heavily shielded casks for eventual transport to a storage repository. Items such as the reactor pressure vessel and its head will be left in situ for possibly the next 20 years to allow the neutron induced radioactivity in them to decay to very low intensities. Only after an adequate time has elapsed will these RPVs eventually be removed, either for the recovery of the expensive alloy steel or for permanent disposal in a radioactive waste facility.

There is experience, now, in the decommissioning and eventual dismantling of reactor pressure vessels, etc, and there will be far more experience, worldwide, after 60 years, the earliest possi-ble time before any of these new reactors in South Africa will come up for decommissioning. The idea that there won't be vast worldwide experience of this process offers no credibility that anyone will have learnt anything about the process in that period of time, which is patently untrue.

The concern over decommissioning is, therefore, totally misplaced.

Response (27)

Comment noted. The IAEA has reported that in 2005, about 8 power plants have been completely decommissioned and dismantled with the sites being released for unconditional use, a further 17 are partly dismantled and safely enclosed, and 30 are under going minimum dismantling prior to long-term enclosure. The proven techniques and equipment to dismantle nuclear facilities safely have been demonstrated world wide. These techniques will continue to improve.

Your comment (28)

Ditto, Comment (3), quoting - "How is it possible for them to recommend practicable mitigation actions and to recommend appropriate monitoring / auditing program(s) for the issues that cause most concern for the public (decommissioning, which is not covered in the study and health impacts which are also not covered in the study)?"

There is an obvious aspect here which hasn't been given proper thought, although the mechan-ism would need to be negotiated with the DEA. The point is that decommissioning is so far into the future, that the agreement between the DEA and NNR has not, in my opinion, been given its rightful priority in the phases of dealing with nuclear reactors, viz "construct, operate and decommission", although I would argue - see above - that *commissioning* must also be added as a vital phase as well as final dismantling.

Decommissioning and dismantling are so far into the future that there should be an agreement with the DEA and NNR that it these subjects do not need to be considered in detail in the EIA processes *for new nuclear build*, but that they will form the essential part of a future EIA process, or whatever replaces the present system in 60 years time, or even further into the future. Decom-missioning presents no problems for any reactor which hasn't suffered from some accident or disaster.

IT IS RECOMMENDED that Arcus Gibb institute a dialogue between Eskom, the DEA and the NNR with the objective of reaching agreement that the decommissioning and eventual dismantling of reactors so far into the future do not require any exhaustive contemporary discussion for the nuclear build EIA process.

The subject obviously needs to be given a moderate discussion, but going into the in-depth details which Ninette Potgieter considers to be necessary, now, is quite unjustified. It is totally unreasonable and thoughtless to even consider the possibility of being able to closely define, now, those tasks which will relate to the accumulated knowledge of how the two processes will be carried out in 60 years time.

Response (28)

Comment noted. Decommissioning will be dealt with in the NNR process. The National Nuclear Regulator (NNR) has legislated the need for the establishment of a decommissioning plan for nuclear power stations. The decommissioning plan must be submitted before the nuclear authorisation is granted.

Your comment (29)

Ditto, Comment( )4, quoting - "The Revised PoS states that design based accident scenarios will be established in consultation with Eskom (in consultation with potential vendors) and the NNR requirements. Is this not supposed to be an independent study? How can Eskom (and its ven-dors) be one of the specialists providing consultation?"

Perhaps Ninette Potgieter could inform us all which members of the NNR, consultative organi-sations and "vendors, ie the reactor designers, will have better direct experience in assisting in the definition of reactor accident scenarios than the organisation which has the responsibility to establish, with the agreement of the NNR, procedures for managing a nuclear incident or acci-dent, namely Eskom through its nuclear emergency staff? Although the NNR has staff perman-ently stationed at Koeberg, as indeed will be the case at all future nuclear sites, their accumu-lated knowledge will have been gained not merely through theoretical studies, but by a com-bination of engineering and reactor physics knowledge and observation.

Ditto, Response (6), quoting - "The NNR process which will involve public participation will only be initiated once the vendor and associated technology has been selected. The public will have an opportunity to engage with the NNR through their public participation process".

Should this reply not include a comment to the fact that an amendment to the NNR Act requires the NNR to run public participation processes where nuclear safety is concerned? The public doesn't have the opportunity to engage with the NNR merely at grace and favour of the latter, but it is a *legislative requirement*.

Response (29)

Comment noted.

Your comment (30)

ITEM 7 - no comments

ITEM 8a Comments from the TAG Steering Committee, quoting the overlapping paragraph on pp.5 & 6 - "The Overberg too has no existing power corridors from the Bantamsklip site, as evidenced by the extensive route proposals that have had to be put forward to link the power station site with the national grid. If this is a valid reason to disqualify the Brazil and Schulp-fontein sites, then it should, by the same token, be a valid reason to disqualify the Bantamsklip site".

A point nicely made, a tactic which I would be very likely to consider using myself when I would be perfectly aware from reading in the documents the rather different *rationale* for excluding the Brazil and Schulpfontein sites from consideration for this specific Nuclear-1 EIA process. It is obviously paramount, from comments which have been made by the Minister of Energy, that there has to be an absolute top priority applied to getting this first of the new nuclear projects actually started.

Ditto, quote from Comment (6) - "Considering the fact that Vaalputs is within easy reach of both of these West Coast sites, and would make the transport and storage of radioactive waste considerably cheaper than from any of the other sites - - - ".

I wonder what country the writer was considering when he made that comment? Looking at the map of South Africa, distances from the two sites along the south coast are very little different from those two sites up the west coast to the north west of Pelindaba. In fact, none of them are within "easy reach" of Vaalputs.

Response (30)

Comment noted.

Your comment (31)

Ditto, Section 2, quoting from the first paragraph - "Additionally, no mention is made of the consistently increasing levels of radioactive emissions that occur as a result of the ageing of a NPS, and the consequent effects of these higher levels on the surrounding environment on all levels".

The fuel elements in a PWR start with a specific uranium enrichment, and become "spent" at a constant lower enrichment, after which they are removed from the reactor and replaced with new fuel elements. This effectively restarts the process whereby the inventory of fission products once again builds up. It has to be remembered that the fission products are completely contained in the fuel elements, therefore their inventory can effectively never exceed a specific maximum, which will have been reached at the time of shutting down the reactor prior to defueling the spent fuel elements and replacing them with new ones. And so is the cycle is repeated at every refueling shutdown. In particular, the fission product inventory of a reactor doesn't continuously increase throughout the life of the reactor.

The only other major source of increasing radioactivity is the material of the reactor pressure vessel and its head, and any ancillary plant and equipment within the reactor containment build-ing which also becomes activated. This radioactivity is generally permanently retained in the materials in which the activation has occurred. Lastly, boron compounds are added to the pri-mary coolant. Only very short half life radioactivity is produced by neutron activation of both the primary coolant - except for tritium - and the boron additive which, therefore, provides its own self-limiting constraint on the amount of radioactivity which can accumulate.

The only place where the inventory of fission products definitely does increase is the spent fuel store as more spent fuel elements are stored in it.

Response (31)

This is incorrect. The water in the spent fuel pool act as shield, even though the inventory of spent fuel elements increases, the amount of dose does not increase. There are administrative limits to ensure that the radiation dose is within the limits.Therefore environmental radiation levels do not increase as reactor life increases.

Your comment (32)

Ditto, Comment (12), quoting - "- - - there is no acceptable and long-term solution regarding the issue of the disposal of every grade of nuclear waste produced by such a NPS, - - - ".

Nuclear specialists are able to make perfectly adequate proposals, now, on how such radioactive wastes can be most satisfactorily permanently stored. The problem arises entirely from the objections which are levelled against this or that proposed disposal site by, generally, the local inhabitants. So, time and time again, the problem becomes shelved. And through all this time, the radioactivity is continuing to decay and, thereby, become less of a problem once a reactor has been decommissioned.

Response (32)

Comment noted.

Your comment (33)

Ditto, Comment (13), quoting - " - - - as the benefits would cease to exist when the site is decommissioned after 30 years".

The projected lifetime for the new generation of PWRs is 60 years, *as a minimum*. Who can predict, now, what the situation may be with future approvals from the NNR (or its successor) for their continued operation beyond 60 years?

Response (33)

Comment noted.

Your comment (34)

Ditto, Comment (19), quoting from the first paragraph - "Re: 5.3 – Alternatives Assessed – 'Given the urgent power demand based on economic growth in South Africa, the no go option is not considered to be a logical alternative, as Eskom must provide power'. *We take exception to* the assumption that nuclear power is the only viable option to provide the power required, particularly in light of the comments made by Rod Gurzynski" *[My italics].*

So, these people believe that they have been insulted - "take exception to"? Did they not appre-ciate that, out of the total new generation capacity required by 2025, viz 40 000 MW, just 20 000 MW is recommended to be provided by nuclear? To *take exception to* is used to describe a reaction to an insult. In what way did they consider that they had been insulted by the Minister of Energy's statement made either in 2008 or 2009?

Further on in the same paragraph is this comment "It is a fact that towns like Freiburg in Ger-many have managed to stave off the construction of a nuclear power plant in their vicinity and to prove their point converted almost the entire town to power-sourcing and operational principles that are governed by ‘green’ methods."

There is no mention what the so-called "green" generating methods are which have been adop-ted for the German town of Freiburg. Are they totally independent of the German national grid? Is it known what the "green" generating capacity is in comparison with the base-load requirement for the town? And from what source(s) does / do their peak requirement(s) come from? Do their "green" sources of supply provide supplies 24/7, with no need to import from the national grid? I rather take exception to the insult to *my* intelligence, and that of many other people, that we should be expected to accept as gospel truth such a bald statement without questioning it, and without any evidence having been provided to demonstrate what the guaranteed base-load elec-trical supply situation is in the city.

Thus do those who like to provide comments compromise their credibility.

Response (34)

Comment noted.

Your comment (35)

Ditto, Comment (21), quoting - "the decommissioning aspect of the proposed NPS's has not been sufficiently addressed"

Here we have a further demand for comments on activities, ie decommissioning *and dismantling*, which it won't be necessary to deal with for a minimum of 60 years. It is inappropriate in this EIA process for these aspects to be dealt with in detail - see my comments and recommendation above.

Response (35)

Comment noted.

Your comment (36)

Ditto, Comment(29), quoting - "Eskom has addressed *radiology* concerns raised by I&AP's rather than the independent specialist appointed to this task" *[My italics].*

There are no *radiology* concerns associated with nuclear plants: this subject is dealt with by hos-pital radiology specialists dealing with patients. The correct word to have used is *radiological*, ie the health effects of ionizing radiations. It is curious that the writer doesn't accept that the health physics staff, both professional and technical, are not well qualified specialists in their sphere of work. For an independent individual to become a radiological specialist requires a person who has had years of working experience in a radiologically controlled environment. Other than inde-pendence, what makes such an individual less of a specialist than the same individual who has worked in the radiological safety profession for many years, and who is then recruited to be an independent specialist with an assessing firm?

Response (36)

Comment noted.

Your comment (37)

ITEM 8b, 9, 10 – no comments

ITEM 11 Response to the comments from the St. Francis Kromme Trust, quoting Response (3) - "Associated Infrastructure is discussed in Chapter 4 of the Final Scoping Report, and includes: a fuel buil-ding; reactor building; safeguard building; diesel building; turbine building; waste building; nuclear auxiliary building; the electrical building; access building and the office building."

This response has omitted two other essential facilities which each individual nuclear power stat-ion site will require include, namely a meteorological laboratory for emergency planning purpo-ses, and a seawater cooling intake and condenser building for the secondary seawater coolant system, including the seawater run-off conduit. The electrical building will also require the assoc-iated electrical conducting system to the national grid.

My same point above applies to your Response (7) to ITEM 12, Comments from the St. Francis Bay Residents Association

Response (37)

Comment noted.

Your comment (38)

ITEM 13 – no comments

ITEM 14 Comments from Amanda and Charl Laubscher, quoting from an Eskom response – "ESKOM: 'Experience gained internationally is that people do not become ill or die from living in close proximity to a nuclear power station.'
CANE: This is a blatantly false answer. See the response of Dr Leslie London with regard to the original PBMR EIR. See also Elizabeth Cardis et al, Ernest Sternglass, Rosalie Bertell, etc. etc"

One invariably runs into the problem that negative viewpoints are taken as gospel, with no consideration for the positive comments and the reality of the evidence which may be applicable. This attitude is typical of the contemporary controversy over global warming. Releases of radio-nuclides into the environment – primarily the sea for the proposed Eskom nuclear projects – are controlled under very close release conditions, to ensure that the ICRP recommendations are strictly adhered to as *maxima*. Although certain radionuclides can become concentrated in specific body organs, there are no ionizing radiations emitted during the radioactive decay process which are any different from what arise from natural ionizing radiation sources in the environment, both from cosmic and terrestrial origins.

Response (38)

Comment noted.

Your comment (39)

Ditto, another Eskom comment – "ESKOM: 'Everybody is exposed to natural background radiation everyday from, for example, the earth itself, the materials from which buildings are constructed, the sun, and on a less regular basis from medical exposures (X-rays).'
CANE: This is a red herring, designed to obscure the scientific facts. We are NOT talking about background or external radiation: we are talking about man-made, INTERNAL DOSES of ionizing radiation.

With similar points being raised in this fashion by the Laubschers, there would seem to be a good case for Eskom to modify information and lecturing presentations at the Koeberg Visitors Centre, where a different practical approach to providing information could be achieved rather than merely responding in writing. Eskom could also consider the possibility of agreeing to their specialist staff meeting such people as the Laubschers - by special arrangement, of course - in order to gain the benefit of direct interaction with the public. In these circumstances, the evening KPSIF meetings may not always be the best medium to achieve the right level of interaction – or necessarily the best time, either.

However, whilst the Laubscher's are demanding scientific evidence from Eskom in support of the veracity of their statements, one needs to question whether the Laubscher's are able to sensibly assess whether the information which has been provided by the authors whom they quote have been entirely honest in their analysis of the data that they have at their disposal? Did these authors obtain the data themselves through which they reached their negative conclusions, or is the data they used an accumulation of data from lots of other presumably research workers, and has it all been properly verified? And what population groups, if any, were used as controls?

Response (39)

Comment noted.

Your comment (40)

ITEM 15 – no comments

ITEM 16 Comments from Ms C T Garbett, Comment (1) quoting – "The requirements for another 20 000 MW of nuclear (or any other power) needs to be demonstrated and should take into account that energy saving in all forms will be the focus globally which inevitably will lead to a change our *[sic]* power needs and methods of generating substantially" *[sic]*.

The worrying part about this comment is the assumption that Eskom, with decades of experience in providing power supplies to commerce and industry, is unable to make a reasoned assess-ment of future power needs, in relation to what the government would like to achieve in the expansion of the country's economy, at least as a first line of attack to the problem. Whatever the basis for the figures which Eskom might have provided to the Department of Energy, this pre-sumably would have been independently checked before any decision was made by the DE for the current accepted figure of an additional ~40 000 MW of generating capacity by year 2025, of which ~20 000 would be supplied by nuclear power, the remaining ~20 000 MW by a combination of coal and the so-called "green" energy sources.

One can persist in remaining rigid with a point of view with total inflexibility, of course, which in the long term grossly detracts from credibility. And if such inflexible viewpoints are accepted without question, this is one scenario which can lead to bad decisions being made and accepted, not merely to satisfy the restricted point of view of Ms Garbett, but for tens of millions of uninformed and unsophisticated South Africans in the future. Does Ms Garbett really believe that all those poor people campaigning for the lack of service delivery, including electricity supplies, would be much concerned about the primary power source? This is not to say that any source can be used which could subject the population to great hazard but, in the weight of the thou-sands of operating-years of experience of using PWRs across the world, their nuclear safety has been demonstrated to be pretty well assured. Modern Gen.III reactor designs are now available, incorporating improvements based on operating experience with earlier designs. These improve-ments would not be expected to lead to design faults which could compromise nuclear safety.

Motor vehicles can be considered to fall into a similar position, where performance, etc, has continuously improved ever since the first mass produced motor car, the famous Ford Model T of 1910 came on to the market. Recent problems associated with accelerator over-running of some Toyotas are to be compared with introducing a totally different and untried principle for a nuclear reactor, not to a design modification problem. (For a relevant comparison, just imagine the con-nection from the accelerator pedal to the throttle being totally electrically controlled through a mini-computer and connecting wires with plugs and sockets, not by the conventional mechanical linkage). However, unfortunately a major difference is road safety: speed and inattention kills, as the slogan goes. And that's why reactor operators require a great deal of training and retraining, with psychometric tests being carried out on otherwise suitable candidates to assess their capacity not to panic under emergency situations.

Response (40)

Comment noted.

Your comment (41)

Ditto, Comment 2.4, quoting – "2.4 Costs of de-commissioning".

First, it has to be appreciated that the decommissioning phase won't be reached for a minimum of 60 years. This is a rather long time in advance to be able to produce sensible figures for costing the process. It is arguably rather curious that it is believed that such figures can be assessed today, with

no knowledge of how the economy will change over 60 years, what the value of money will be, and various other factors, including South Africa's position in the world's economy.

Second, decommissioning is *not synonymous* with dismantling, a process which could be delay-ed for a further 50 years after the decommissioning process has been completed. That gives something like 100 to 120 years forwards in time. Expecting costs to be provided for this final process so far into the future would be totally meaningless. But it's a very good point to raise, even if it is made without thought, in the hope that it might cause problems with the approval of the EIR by the DEA, and perforce encourage other commenting groups and / or individuals to pursue the same question. This is clearly a situation where sheer pragmatism has to prevail, whatever indiosyncratic observations are made.

Ditto, Comment 2.6, quoting – "2.6 Cost of 3rd party liability insurance for worst case scenario following catastrophic nuclear accident e.g. wind blowing in direction of largest town / city at time of nuclear accident at various wind speeds from minimum to maximum."

Although contemporary costs for such insurance can obviously be produced, the question should be confined to, say, the next two decades. It would be impossible to assess what the insurance situation might be in 40 to 60 years time.

Response (41)

Comment noted.

Your comment (42)

Ditto, Comment 2.11, quoting - "2.11 Costs of government subsidies and investment per Indus-try".

What will be of great interest is the outcome of very recent comments made by the French Presi-dent, Nicholas Sarcozy, complaining that the IMF, for example, has never provided any advance funding for the construction of nuclear power plants in developing countries. Although one can only guess, this could mean that Eskom, and utilities in other developing countries, would seri-ously consider choosing the Areva EPR rather than the Westinghouse AP 1000 reactor type if such advance funding was to become available. There is no question that Sarcozy would ever have raised this point in support of the AP 1000!

Response (42)

Comment noted.

Your comment (43)

Ditto, Response (5), quoting - "Your comment is noted. The reactor containment buildings of the reactor technology are designed to ensure that no radiation escapes under any conceivable cir-cumstances, from a severe accident core meltdown accident like Chernobyl, an earthquake to a jumbo jet collision. The safety aspects of the nuclear power station will be discussed in the EIR. However safety will be evaluated as part of the NNR licensing process".

It is unfortunate that Chernobyl is brought into the picture as a possible reactor accident scen-ario. TMI-2 is the much more likely scenario. To mention Chernobyl as a possible accident / dis-aster scenario indicates that the great differences in the reactor designs has not been fully appreciated, or they might even ha ve been deliberately ignored. A PWR is a water cooled reactor, which fails safe, ie it goes sub-critical, if the water level falls below the fuel elements, although there's still a great deal of heat on the fission products in the fuel, around 10 MW at shutdown. It was this heat which melted the fuel elements in the TMI-2 core, and it wasn't brought back to a safe state until the primary circuit

water was once again recirculating through the now very badly damaged core. A PWR has what is called a negative reactivity coefficient – thus if the moderator is removed from a critical core it will automatically become non-critical.

The reactor at Chernobyl was a RBMK graphite moderated reactor, with no internal pressure, but with many water pipes running through the core to raise the steam to run the turbines. *But water is used as the moderator in PWRs*. Without going into the details of the sequence of events, suffice it to say that the water level was allowed to fall in these tubes to a dangerously low level. Thus it was no longer absorbing neutrons, which were then able to multiply freely in the graphite moderator. It was this neutron multiplication which resulted in a prompt criticality event and the instantaneous production of tens of megawatts of heat. This caused tremendous pressure in what water remained in the tubes which failed under the extreme steam pressure, which literally blew off the cover to the reactor vessel, which was only retained in position by its ~64 tonnes weight. Once uncovered to the atmosphere, the already almost red hot graphite started to burn as oxygen was now able to access it, the very hot combustion products taking volatile fission products and radioactive particulates high into the atmosphere. The larger particulates fell back to the ground within a few tens of kilometres of the source.

The RBMK design of reactor has what is called positive reactivity. In other words, by removing the water and failing to accommodate this by not inserting the control rods in time and this situation leads to a prompt criticality event.

The two reactor types are, therefore, in no way comparable where their fail safe characteristics are concerned. The idea of making a comparison with Chernobyl is usually the result of it being far easier to do so than to properly explain why this comparison is incorrect – if indeed the expla-nation is properly understood. The incident was, of course, hugely dramatic, internationally, and it's a scenario which is for more acutely retained in people's memories than the relatively mild accident at TMI-2.

Response (43)

Comment noted.

Your comment (44)

Ditto, Comment (7), quoting from the second paragraph – "Emerging technologies, such as thin film PV which is predicted to become the cheapest form of energy generation within the next few years".

This development looks like the sort of concept which would be ideal for the home. The practi-cality of devising such an installation to produce 400 or 765 kV 24/7 would be a rather taxing problem, in view of the fact that at any one spot on the earth's surface the sun doesn't shine 24/24. For home use, battery storage would become practicable in view of the relatively limited individual home demand. Enthusing about such developments for high output central generating capacity, ie generating 24/7, would not be not helpful where commerce and industry are con-cerned.

Response (44)

Comment noted.

Your comment (45)

ITEM 17 & 18 – no comments

ITEM 19, Comments from Ingela Richardson, quoting from Comment (1) – "Nuclear waste and used fuel is highly radioactive. There is no way to "dispose" of it. It is stored on site at Koeberg or buried underground at Vaalputs. It remains toxic to all life for thousands of years".

Certain radionuclides most definitely have very long half lives, and will remain wherever they are put into repositories for a very long time. Most fission products will have decayed to effectively zero activity after a period of around 300 years. The transuranics, including Pu-239, do have relatively long half lives, but it is very likely that these radionuclides will be capable of being used as fuel in future Gen.IV fast breeder reactors. In fact, the development of this reactor type has very likely been prompted by the concerns universally expressed about Pu-239 because it is fissile and also it is a bone seeker where, with its high energy alpha particle emission when it radioactively decays, these can result in bone cancer. Although there might not be obvious means to permanently store this radioactivity at the present time, it is much more likely that in a decade or two, the technology will be available to use them in fast breeder reactors as a means of eliminating them from even having to be put into repository storage.

Currently, spent fuel elements are mostly in store in the spent fuel pools at the various nuclear power stations round the world. For the next 20 years this could well be the safest place for them to remain, by which time the new technologies to make use of the recovered uranium and transuranics as reactor fuel, and other means to deactivate the residual long half life fission pro-ducts to non-radioactive nuclides is very likely to be available. If all the spent fuel elements were to be put into deep repositories, they would eventually need to be retrieved for the necessary reprocessing to separate the potential nuclear fuel content from the fission products, the latter for denaturing in a suitable neutron facility, which would most likely be a self-sustaining process in order to be economically viable.

The nuclear wastes are not produced inside the core but occur as a result of maintenance work on ancillary components of the reactor systems during normal shutdown schedules, such as tools, removed ancillary equipment, protective clothing and cleaning materials. Their radioactive contamination or activation is usually at a level satisfactory for disposal at Vaalputts. The main very high level radioactive components are the spent fuel elements, which will remain in the spent fuel pool at Koeberg for many years into the future.

Response (45)

Comment noted.

Your comment (46)

Ditto, Comment (2), quoting – “Nuclear energy is well known as the most expensive form of energy on the planet. The people of South Africa are being asked to pay ever higher electricity bills to cover nuclear expansion.”

Nuclear is only one half of the total additional generating capacity by 2025 of 40 000 MW. Being too dogmatic about the cost of nuclear may possibly be overtaken by the cost of solar concen-trating, which also requires large tracts of land for the heliostats. But whatever generating tech-nology is used, where else other than from the consumer will the cost eventually come from, even if Eskom is able to obtain loans for the construction works? Loans have to be repaid, wth interest.

Response (46)

Comment noted.

Your comment (47)

Ditto, Comment (4), quoting – “South Africans have also not been told how the government plans to transport nuclear fuel from Pelindaba in Pretoria to these nuclear reactors or transport the waste. In many countries around the world, there have been accidents and spills with this kind of waste.”

Low level waste which is compactable is most commonly transported in 50 gallon drums. Acci-dents could, therefore, give rise to spillages. However, spent fuel elements are transported in very heavily shielded cast iron casks, which have been subjected to massive tests in simulated accident scenarios. As far as I am aware, a cask has never been broken open in any of these tests.

Where the transport of new fuel elements is concerned, and where they come from, arguably the worst hazard would arise if the fuel element containers were to become involved in a petrol or diesel fuel fire. No doubt this scenario will be covered by the specialist contracted to carry out this particular work. At the present time I am not aware of proposals for South Africa to construct a PWR fuel element manufacturing facility, so presumably all fuel elements will be imported. But who can predict what the situation might be in 40 to 60 years?

Comments have been made on the feasibility of South Africa having its own fuel element manu-facturing capability in view of the fact of having its own uranium ores, but to go with that capability would necessarily be ore and spent fuel element processing facilities. However, these aspects have nothing to do with the scope of this particular EIA process.

Response (47)

Comment noted.

Your comment (48)

Ditto, Comment (5), quoting – "Uranium miners in the US got cancers at a much higher rate than anyone else."

This is a very interesting observation - although it is totally irrelevant to this EIA process - because it misses the major point: uranium miners do not suffer from an enhanced incidence of lung cancers from breathing in uranium dust, against which they are protected in any case with filtered breathing equipment. It was the leakage into the atmosphere of the mine workings of the radioactive Nobel gas, Radon-222, which was breathed in that caused these health problems. (This radionuclide occurs in the decay chain for U-238). Uranium mines require very frequent air changes to keep down the radon 222 concentration, although charcoal filters in breathing facemasks do absorb it. Rn-222 is a high energy alpha emitter with a half life of 3.82 days, so it is highly radioactive, but it decays very quickly. It is present in all uranium mines, being in equilib-rium with the radioactive decay chain from U-238, until the mining activities break that chain with its release into the atmosphere of the mine tunnels, being the only volatile component in the chain.

Response (48)

Comment noted.

Your comment (49)

Ditto, Comment (7) by Magnus Linklater, quoting – "Take carbon emission. There is a blithe notion that nuclear power is "clean" — it emits no CO2 and therefore does not contribute to global warming.

This argument has been systematically taken apart over the past five years by two independent experts, Jan Willem Storm van Leeuwen and Philip Bartlett Smith, one a chemist and energy specialist, the other a nuclear physicist, who between them have a lifetime's experience in the nuclear industry. What they have done is look at the entire life cycle of a nuclear power station, from the mining of the uranium to the storage of the resulting nuclear waste. Their conclusions make grim reading for any nuclear advocate.

They say that at the present rate of use, worldwide supplies of rich uranium ore will soon become exhausted, perhaps within the next decade. Nuclear power stations of the future will have to rely on second-grade ore, which requires huge amounts of conventional energy to refine it.

Response (49)

There is currently about 5.4Mt of measured resources of uranium referred to as Reasonable Assured Resources and Inferred resources in the world that would last for about 80 years according to the OECD NEA & IAEA Uranium Resources, Production and Demand 2009 (known as the Red Book). Currently nuclear reactors utilized about 68 000 tU/yr. The use of secondary sources of uranium would increase energy security.

Your comment (50)

Despite what Linklater has to say about the CO2 emitting energy sources to produce the elec-tricity requirements for ore mining and the concentration, separation, etc, of the uranium, the fact is that CO2 emitting energy sources predominate throughout the world, whether they are used for all the tasks leading up to the construction of nuclear power plants, *or for any other electricity generating technology*. Do the authors of the other report referred to provide any comparison data to support nuclear as using the greatest amount of CO2 emitting energy resources? Do they give data for new coal fired power stations, including the amount of C02 they will emit into the atmosphere – both with and without alleviating measures – over a typical power station lifetime?

Without these data, the credibility of their report risks its status being compromised.

A final point which I find to be rather unfortunate is that the reference to the website given for the National Nuclear Regulator Annual Report 2006/07: briefing, *in which the url should be hidden*, is not in a format which can be opened. Was it checked beforehand to see that it would work? Or, alternatively, its url needs to be provided which can then be copied and pasted into the IE search engine.

The Parliamentary Monitoring report was apparently published two years ago: has the situation at the NNR improved in the meantime? It would be disastrous for Eskom and the DE to want to prioritise this Nuclear-1 project if the NNR lacks the capacity to be able to adequately carry out their nuclear safety analysis of whichever PWR design Eskom wishes to have. Without clarifi-cation, this would appear to be a rather curious situation.

Response (50)

Comment noted.

Your comment (51)

ITEM 20, comments provided by Rod Gurzynski, EcoProgram, Comment (1): as with other people and organisations who have provided comments, there seem to be problems amongst them in properly appreciating the objective of an EIA process for which its objectives have been clearly defined. If the objectors don't approve of nuclear power, it is most certainly is their prerogative to make their point of view known. However, if they don't consider that this particular EIA process should be concentrating on nuclear power, it needs to be noted that the facilitators for the EIA process aren't the people who make these decisions.

The Department of Energy has stipulated its mix of electricity generating technologies compris-ing an additional 40 000 MW generating capacity being required by 2025, 20 000 being nuclear and the remainder being provided by a mixture of coal and the so-called renewables. There has surely been adequate opportunity for these objectors to have approached the DE and put their case to that

Department's Minister? The cogent question here, is: why haven't they done so? Why leave raising their objections to the actual EIA process?

Response (51)

Comment noted.

Your comment (52)

Ditto, Comment (2), quoting – "UCT's Energy Research Centre's renewable electricity study (2008) [1] has found that "...there are grounds to take renewable energy seriously."
In view of the fact that the DE has stated that 20 000 MW of the total additional generating capacity of 40 000 will be from renewables and coal, there doesn't appear to me much of a con-flict in that decision about the place renewables will take in the energy mix. One could argue, in the lack of direct information to the contrary, that the viewpoint expressed in the UCT report might have contributed towards the decision of the DE in its mix of energy generating technol-ogies.

Response (52)

The Integrated Resource Plan 2010 will outline what are the country's energy requirements and when that capacity is required, the resource plan will also outline the mix of energy technologies that are required to meet the energy demand.

Your comment (53)

Ditto, Comment (4), quoting – "Intermittence: It is not correct to say that renewable energy is intermittent and nuclear power is not. Renewable energy from wind is variable and from solar thermal with hot salt storage, reliable. South Africa has adequate wind resources for 30% aver-age availability [4], which is spread across numerous locations and the solar capacity of the Northern Cape is the best in the world. Nuclear is intermittent because it can only function as a base-load, and is not variable due to safety considerations, and so it is either on or off."

Whilst the comments above relating to wind and solar *concentrating* power are essentially correct, the assumption that nuclear reactors are either "on" or "off" – to use the author's rather unorthodox terminology - is quite incorrect. PWRs are closely controllable throughout their power range. There is no problem in altering their output to produce steam sufficient to run the turbogenerators at from, say, 50 % to 100% generating capacity. The author seems to have been confused with the Russian RBMK type of reactor which has a positive coefficient of reactivity, making it highly unstable through its lower power range. The baseload requirement is effectively a continuum of generating capacity, but which obviously varies at different times of the day and week. There are no special safety considerations to deal with in varying the power output of a PWR compared with an RBMK reactor.

Response (53)

Comment noted.

Your comment (54)

Ditto, Response (5) – there is supposed to be a Westinghouse AP1000 version capable of gener-ating about 1600 MW(e). As I understand, the highest output of the Areva EPR is around 1250(e) MW. That's just about as high a generating output that any PWR is designed to produce. How-ever, was the writer quoting the *total* power output of the PWRs, ie MW(t), or their *electrical* output, ie MW(e)? It's a very important point to be quite clear about, and which the author has omitted to give any indication which power output he was referring to.

Response (54)

AP1000 power output is 1117 MW(e) and EPR is 1600 MW(e)

Your comment (55)

Ditto, Response (6), quoting – "The alternative power supplies for the Koeberg plant is *[sic]* less [than] 20 MW for the entire site. This is met by the existing Acacia Power Station (3 x 57 MW) because at the time of Koeberg's construction there was no other dependable generation in the Western Cape - - - ".

This part of the response is no longer correct. For the past three to four years Eskom has had its 100 MW OCGT plant at Atlantis in full operation, which can be run up at any time to provide the emergency power requirements for Koeberg. It is being converted to a CCGT plant. In addition, I was involved with a mini-EIA process at least two years ago for the transfer of the power gener-ating units at Acacia to the Atlantis CCGT site. I very much doubt if the Acacia plant is even there, now, let alone running.

Response (55)

The Acacia plant is still in operation, it provides back up electricity for Koeberg Power Station.

Your comment (56)

Ditto, Comment (7), quoting – "It is strange indeed to preclude renewable forms of energy from Eskom's planning and the EIA itself because they are assumed to be 'inadequately developed' and yet absolve the EIA from assessing impacts of the decommissioning phase of nuclear power. ."

Indeed, an elegant point! However, the decommissioning phase for the Nuclear-1 reactor will not arise for a minimum of 60 years after the units first go critical. Perhaps the author would be good enough to expand on his elegance and inform the facilitators whom he would be prepared to recommend to approach for an estimation of the costs of a decommissioning process 60 years or more into the future? In contrast, the costs of the other non-nuclear technologies which have yet to be fully developed will probably be known within the next five years, providing the devel-opment of those technologies continues apace. If it doesn't continue, then their development feasibility would obviously come into serious question.

Another point is that decommissioning is only a part dismantling process, such as removing ancillary plant and equipment from the containment building – and elsewhere outside it, of course – and defueling. The final dismantling process may not take place for a further 30 years. Thus the costs of the decommissioning and dismantling processes would need to cover a period in advance from now of between 60 and nearly 100 years. The response offered by the facilitators would, therefore, appear to be perfectly satisfactory.

Dealing with the spent fuel elements is yet another factor which must be borne in mind. And when the fuel pools at all the multiplicity of nuclear power stations around the world are finally emptied will depend on a number of factors, such as the availability of repositories; and whether it will be decided, instead of long term repository storage, to process these spent fuel elements and to use the separated uranium and transuranics in future fast breeder reactors, leaving only the residual long half-life fission products to go into repository storage.

Response (56)

Comment noted.

Your comment (57)

Ditto, Response (7), quoting the sixth paragraph – "Projects are already underway regarding the different energy sources. This EIA is for only one of the projects that are proposed, separate EIA's have been completed for two coal fired power stations and a third for two future power stations is in progress. An EIA for a 100 MW wind facility has been completed and another for future wind power has been initiated."

Although I wasn't involved in the EIA process for Eskom's solar concentrating power station to be located near Upington and which was approved by the then DEAT, about three to four years ago I obtained the full documentation for this 100 MW facility. This facility needs to be added to the above list because it helps to answer some of the points that have been raised wrt alternative energy generating technologies which have already been considered, with positive outcomes.

Response (57)

Comment noted.

Your comment (58)

Ditto, Comment (9), quoting – "Environment: The specialist consultants are asked to provide a description of the affected environment. From an economic perspective, the affected environ-ment is the entire future shape of South African economy and the type of work and of industry that will prevail. To do justice to this, none of the impacts mentioned in the EIA study's terms of reference for the economic assessment (4.5.13 Economic. Pg. 25) can be assessed without an assessment of the alternatives."

Whatever the rights or wrongs of this statement, one factor which must be taken into account is the area of land required for both wind and solar concentrating generating technologies. For a 100 MW wind power station, at least 30 $km^2$ of land are required for 50 x 2 MW wind generators. For the projected 100 MW solar concentrating power station near Upington, 4 $km^2$ are required for the 4000 heliostats required to provide the sun's heat to the molten salt tower. In contrast, for a 4 000 MW(e) nuclear power station with three nuclear power units, only about 2 to 3 $km^2$ of land will be required.

On land usage alone, these large areas could be prejudicial to maintaining the quality of the environment – most certainly in the case of the closely spaced heliostats for a solar concen-trating system.

Response (58)

Comment noted.

Your comment (59)

Ditto, Comment (10), clause 10.3 – "• 10-3: Decommissioning and waste management impacts can not be excluded from assessment, as proposed in the present study, nor the costs."

Refer to my comments above about timescales for decommissioning long into the future -Comment (7).

FPoS APPENDIX 3 - SUBMISSIONS

Submission 2b I don't understand this comment from the 4th paragraph, quoting - "The health effects of the *[Chernobyl]* accident were the subject of two major conferences, in Geneva in 1995, and in Kiev

in 2001. But the full proceedings of those conferences remain unpublished – despite claims to the contrary by a senior WHO spokesman reported in Le Monde Diplomatique."

The delegates wouldn't have been sworn to secrecy! They would have been given the usual con-ference packages, which would include all the papers. So there must be a lot of copies out there in the possession of the original conference attendees. With this knowledge, for the conference organizers to remove allegedly sensitive papers from the conference publication sounds rather strange. Could any of the delegates not have been asked to see these papers, or if indeed they were requested to return certain papers? However, where the Kiev conference was concerned I'm not so sure that I should be too dogmatic about it. None-the-less, presumably the conference presentations which allegedly haven't yet been published in the conference' proceedings were actually presented to the delegates. There would also have been the normal associated discus-sion sessions, which are usually recorded these days. For what I assume to have been two open scientific conferences – were they organised by the Russians or the IAEA? - it would appear to me to be rather strange that the proceedings haven't been published. For the author to make such a statement without indicating if he had done any follow-up investigation wasn't very helpful. Is Oliver Tickell a radiological specialist or a journalist?

For the facilitators again: please note that the blue highlighted references in this document (opened up from the CD Rom sent to me) which should be capable of being accessed on the internet by clicking on them, cannot be opened. This inability to open up these reference reports and documents seriously detracts from being able to assess the quality of these communica-tions, a matter about which surely the DEA are also going to be concerned. I have separately e-mailed Bongi Shinga of Acer Africa about this point. I note that the problem is because the hidden url can't be recognised. Thus some references given in *full* url format in Submission 2c *can* be highlighted to open their websites.

Response (59)

Comment noted.

Your comment (60)

Ditto, p.1 sixth paragraph, quoting – "The British radiation biologist *Keith Baverstock* is another casualty of the agreement, and of the mindset it has created in the WHO. He served as a radiation scientist and regional adviser at the WHO's European Office from 1991 to 2003, when he was sacked after expressing concern to his senior managers that new epidemiological evidence from nuclear test veterans and from soldiers exposed to *depleted uranium* indicated that current risk models for nuclear radiation were understating the real hazards."

Please note that, because of the highlighting problem, I am unable to download the two refer-ences in this paragraph which I have indicated in the above quote in *italicised blue*. A very important aspect which I want to know is whether the deleterious health effects of the depleted uranium intake by the British soldiers in Iraq were the result of the ionizing radiations emitted when U-238 nuclei radioactively decay in the body, or whether the effect was due to the *chemical poisoning* by the depleted uranium intake, presumably received through breathing it into the lungs rather than through ingesting it. It is a very important point to be able to read what the conclusions were, as well as knowing the exact reason for the WHO dismissing Baverstock, allegedly for his viewpoints about the soldiers who had been on duty in Iraq when depleted uranium ammunition had been used. The article clearly isn't based on any scientific analysis of the information provided in the various references.

Response (60)

Comment noted.

Your comment (61)

Submission 2c HEPA filters. A "dossier" submitted by the PWG – no comments at this stage

Submission 2h Release of "permissible" levels of radioactivity from nuclear plants, quoting Clause 9.A USA report submitted by the PWG - "Government regulations allow radioactive water to be released to the environment containing 'permissible' levels of contamination. *Permissible does not mean safe.* Detectors at reactors are set to allow contaminated water to be released, unfiltered, if below 'permissible' legal levels."

The ICRP Recommendations are based on radiation levels which are well below the natural radiation background, which itself can vary quite considerably in different parts of the world, largely depending on the concentration of uranium in soil and rocks. The philosophy is, basic-ally, that all plants and animals, including *homo sapiens*, have successfully evolved in a back-ground continuum of ionizing radiations, both from cosmic and terrestrial sources. The nature of these naturally occurring ionizing radiations is exactly the same as those emitted from radionu-clides, with the single exception that there are very few neutrons to be found in the natural background, and what do occur arise from rare U-235 and U-238 fissions in natural uranium. However, neutrons are not emitted by any of the radionuclides which are released at permissible levels into the environment.

By "permissible" is meant the intensity of ionizing radiations arising from radioactive decay which won't have any deleterious health effect on human beings through their lifetime, in excess of the rare effects which arise from exposure to naturally occurring ionizing radiations. It is necessary to appreciate that evolution has been extremely successful in accommodating the natural ionizing radiation background in such a way that it doesn't cause any readily detectable health detriment effects. If this wasn't the case then there is no way that mankind, and all other animals, etc, could ever have evolved. Indeed, there is reason to believe that low levels of expo-sure to ionizing radiations is even beneficial to good health. This would not be unexpected, because the major effect of ionising radiations is to cause breaks in complex organic molecules, and the highly complex DNA molecules, in particular. Repair mechanisms must have evolved to successfully carry out repair work, otherwise it is impossible to conceive what sort of aberra-tions might have resulted. Even now one finds perfectly viable babies with four limbs and, yes, even with two heads. Although such unfortunate aberrations haven't yet been proved to be cau-sed by ionizing radiations – at least as far as I am aware, but I stand to be corrected – it is highly probable to be the case because there are no other vectors which could cause such effects which wouldn't be chemically poisonous and cause massive tissue damage.

Submission 2i, The Catastrophic Economics of Nuclear Power, by Harvey Wasserman – a rather startling scenario has been pictured of comments in the NYT; the virtual collapse of Atomic Energy of Canada Limited; and the French Areva company for it's acknowledged fiasco in the construction of its first-of-class 1600 MW(e) EPR at Olkiluoto in Finland.
I don't know anything about the AECL, so I can make no sensible comment about it. But I would guess that the almost extreme comments made abut AECL may reflect other issues than the exact truth.

However, I rather like this quote from the 4$^{th}$ paragraph on the second page, for what it omits to say rather than from what it does tell us: "The Paris-based energy expert Mycle Schneider reports that of 45 reactors being built worldwide, *22 are behind schedule and nine have no official ignition schedules*." *[My italics]*
First, there's no mention of the reasons for 22 new reactors under construction being behind schedule; and second, to use the word "ignition" in substitution for "commission" is rather quaint!

Who is Harvey Wasserman?

Submission 2l Dirty Secrets About Nuclear Power, by Russell D Hoffman, quote from the last paragraph on p.1 - "And as for future possible generations of new reactors, they have their own problems INCLUDING unexpectedly rapid embrittlement of the cladding for the radioactive fuel pellets, which could lead to the very catastrophic failures they CLAIM can't happen."

Has this claimed *rapid* embrittlement *o*f fuel cladding occurred during reactor trials? If this is indeed the case, and having been identified, have measures been implemented by the fuel manu-facturer to change the material of the cladding to a more neutron embrittlement resistant mater-ial? It would be extremely unlikely that, once the problem had been identified in test fuel ele-ments, measures wouldn't have been immediately implemented to isolate and rectify the prob-lem.

Is it not sheer cynicism to consider that the nuclear industry has only the worst motives in mind, when it knows only too well that another significant internally generated accident like Chernobyl would be likely to have a permanently devastating effect on the nuclear industry? Hopefully, there will never be any external influences which precipitate a serious nuclear accident in a nuclear reactor anywhere in the world.

Response (61)

Comment noted.

Your comment (62)

Ditto, p.3, quoting from the 4th paragraph – "It is now absolutely certain and well-known that radiation causes cancer, leukemia, heart disease, birth defects, and thousands of other ailments. Recently - - - ".

In view of the quite reasonable presentation of the subject in this section of this particular sub-mission, it is very surprising that the authors have missed arguably the most important point of all, namely that evolution has been remarkably successful in preventing any major damage to DNA and proteins which, at background levels, do not normally cause any harm whatsoever to humans, or any other animals. They all had to successfully evolve through that ionizing radiation background continuum, otherwise evolution would have been stopped in its tracks before it ever had a chance to proceed. It should be noted that the natural ionizing radiation background can vary by a factor of about 100, depending where one is on the earth or at sea.

It should be noted that the ionizing radiations found in natural background do not differ in any way from those produced in radioactive decay, with the single exception of the relative rarity of neutrons

So, in what populations across the world has the awful spectrum of aliments listed above been identified to have arisen from the natural radiation background, just for starters?

Ditto, p.3, quoting again from the 4$^{th}$ paragraph - "- - - even some official regulatory bodies have accepted the theory that there is NO THRESHOLD below which radiation is not damaging and CANNOT cause 'health effects'."
*Specifically for regulatory purposes only*, it is rather more convenient to make this assumption when dealing with radiological safety at places of work. (Health detriment is a better phrase to use than health effects). Regulatory bodies are guided by the Recommendations of the Interna-tional Commission on Radiological Protection – ICRP.

Ditto, p.5 Section 10, quoting – "Don't some people say that a little radiation might actually be GOOD for you?"

It's all too easy to let this subject get out of hand. Of course it was not good news to hear of plutonium being spread in the upper atmosphere. As a high energy alpha particle emitter *and* a bone-seeker, more or less any burden locked into the bone structure could eventually cause bone cancer over a long enough exposure period. And tooth X-rays can be a "bone of conten-tion", too, especially if dentists don't really have the right level of knowledge about the dangers of over-exposure to X-rays, even low energy ones. They conveniently stand behind a lead shield and, therefore, they are protected from the exposures. I wonder what they have to say when *they* need a dental X-ray?

However, it is a fact that many of the fission product radionuclides which are normally released from nuclear facilities into the environment at "permissible" levels (or concentrations) in air or water do not enter into any human metabolic cycle, so that in general they are rapidly excreted in faeces and urine. But Sr-90 is one exception, which is reflected in its very low permissible release. This is because it's another bone-seeker like plutonium, although it is a beta emitter, not an alpha emitter like plutonium, and it stays put once it has entered bone.

Insoluble aerosols which are breathed into the lungs are a clear radiological danger, which is why so much attention is paid to the elimination of particulate releases into the atmosphere. Breathed in soluble particulates are rapidly solubilised and are rapidly dispersed in the blood stream.

Whatever the rights or wrongs of whether low level of ionizing radiation might be good for one, let it not be forgotten what I wrote above about all animals having very successfully evolved with a background ionizing radiation continuum inescapably present.

Response (62)

Radiation exists everywhere in the soils, water, food and even in our bodies. Potassium-40 is found in our bodies as part of the natural potassium that sustains life.

Your comment (63)

Submission 4 Strandveld Tourism & Conservation Association dated 24/06/2009, quoting from the last paragraph on the first page – "We hereby *warn* that if the DEAT accepts the way the PPP was conducted it will result in a procedural element that will come under review during an appear *[sic]* or even a court case".

What exactly is their *warning threat* : that the PPP has become unmanageable? The situation has been changed by Eskom, of course, from the original EIA process for *three* nuclear power stat-ions to the current process for a *single* nuclear power station in the first instance, to be sited at one of three locations. The EIA processes for the remaining nuclear power stations will follow in due course.

The writer, Paul Slabbert, appears not to have been particularly interested in the nuclear power station *per se,* but merely in the legal semantics of procedure, presumably in the hope of being able to thwart the process once the EIR had been submitted to the then DEAT. However, these semantics were prepared for the original EIA process, which has subsequently been modified.

Response (63)

Comment noted.

Your comment (64)

Ditto, penultimate paragraph on p.7, quoting – "On 25 June 2009 the I&APs were informed for the first time that the competent authority approved the FSR in the course of November 2008 but requested amendments to a section of the FSR being the PoS. We question the validity of appro-ving the FSR on a piece-meal basis."

I don't appear to have received a copy of the DEAT's response concerning the FSR. Did they approve it but *request* that additional information be added, or did they approve it *subject* to the specified information being added? The subtle difference would surely be highly significant in a legal sense?

Response (64)

Please see attached in Appendix D of the Revised Draft EIR.

Your comment (65)

Ditto, quoting from the 3rd paragraph on p.8 – "As mentioned in the previous paragraph, there is no specific requirement for requesting public comments for a second time after amendments requested by the competent authority have been incorporated. It therefore would appear to us that the only reason for placing the revised PoS in the public domain for comment is to commu-nicate Eskom' intentions regarding amendments they want to make to their application".

It would appear to me that these people are trying to go overboard with cleverness. They must surely be aware that the first EIA process for the PBMR was challenged by Earthife Africa *et al* because documents were added to the EIR which was presented to the DEAT for consideration, which hadn't been presented to I&APs for their perusal. This EIA process came to a halt because of this intervention, although there were other matters of concern which intervened to prevent the process from continuing in its original format.

What these people are saying is that, if the competent authority requires amendments to be made to the PoS, there is no reason for these amendments to be presented to I&APs for their perusal and comments. However, this could possibly attract a challenge from nuclear opponents on simi-lar grounds to their challenge to the first EIA process for the PBMR, which may possibly result in a judge coming to the conclusion that some aspect of the EIA Regulations had been violated by default in not presenting the amendments to I&APs. This could seriously delay the continuation of the EIA process. So exactly what agenda is the STCA pursuing? What is their problem with Eskom being willing to share the amendments with I&APs?

Response (65)

Comment noted.

Your comment (66)

Ditto, again quoting from the 3rd paragraph on p.8 – "This assumption (viz that the PoS was placed in the public domain for comment in order to communicate Eskom's intentions concern-ing amendments to their application) is reinforced by the fact that I&APs were advised that the specialist studies that is *[sic]* being planned to be conducted during the EIA *[sic]* phase of the process have already been commenced. In our view this is totally irregular and makes a mockery of the request for public comments".

Public comments are requested only for completed documents, I&APs having had their say on the PoS. What is mentioned above is irrelevant if the specialist studies have been started, but not completed. In which case the studies won't have been submitted for public comment until they are completed, by which time the necessary amendments will be included. So, what's the big deal, here?

Ditto, p.8 quoting from the last paragraph – "The new draft regulations do not say [sic] that the competent authority can grant permission to amend an existing application - - - "

Haven't I read elsewhere a great emphasis being made of the point that the new EIA regulations state than an application initiated under the earlier EIA Regulations will be continued under those regulations, even though the new regulations may have come into force? However, as Eskom has modified this current EIA process to just one nuclear power station, to be located on one of three sites yet to be confirmed, does this change result in this EIA process coming under the new regulations?

What I find to be very curious are the semantics invoked once again by the STCA. Seemingly it never occurs to them that if the previous EIA regulations permitted amendments to be made, and the new regulations don't, then a very important clause for flexibility has been most likely inadvertently omitted form the new regulations? There's factors in these comments which don't appear to be entirely honest. Have none of the members of the STCA questioned the lack of flexibility in these comments? Were they prepared by the author with no consultation with the STCA's members? Were they even given the opportunity to read the completed version before they were submitted to the facilitators?

It would appear that the objective of the STCA is to squeeze the last drop from the new EIA regulations using controversial interpretations, wth the objective of making it difficult for Eskom to go ahead with any nuclear power project, despite what the Department of Energy has deter-mined to have accepted from the mix of technologies in order to achieve the intended 40 000 MW(e) additional generating capacity by year 2025.

I would hope that this STCA comments' document has been subject to a very careful legal review by a top South African lawyer.

General point made by RMLT: may I point out that no responses have been provided for many of these submissions. Can these be provided, please. It would unfortunate if a situation arose as in the case of the first EIA process for the PBMR when documents were submitted to the DEAT with the EIR which hadn't been provided to I&APs to review, which led to a legal challenge in court.

Response (66)

Comment noted.

Your comment (67)

Submission 6 from Ninette Potgieter, quoting from the first paragraph – "The revised POS states that impacts of decommissioning can only be assessed once decommissioning takes place, yet earlier in the same paragraph the criteria for the specialists studies states that the specialists must, where they are not certain, make educated judgments. If the specialists are incapable of making such judgments, should specialist who ARE capable of making such judgments / assessments (regarding decommissioning) not be appointed also?"

Here once again we have the insistence that the costs of the decommissioning (and dismantling) phase must be dealt with in detail, right now, when decommissioning won't even arise for 60 years after the nuclear plants become operational. Their lifetimes may even be extended beyond 60 years.

It is impossible to predict, now, exactly how spent fuel elements will typically be dealt with in 60 years time, and how technology will have been developed to cut the costs of the process, inclu-ding the use of the fuel in these spent fuel elements in new types of reactor to reduce the final amount of radioactive products to be disposed to very small amounts.

Response (67)

Comment noted.

Your comment (68)

If Ninette Potgieter has the answers to hand, it would obviously be very helpful if she could advise on whom she knows who can, now, prepare an accurate forecast of what technological advances in decommissioning and dismantling will have been made in 60 years time and the costs of these phases which she is so determined should be carried out.

Ditto, quoting item 10 on the last page - "Lastly, the means by which the public is made aware of this study and report is insufficient and discriminatory. South Africa's special circumstances (in light of the history of apartheid rule) has resulted in an entirely different social dynamic in South Africa. A large part of the population is illiterate and not able to read newspapers. Many cannot even afford to buy newspapers. Also due to the injustices of the past, a large part of our population will not comprehend the meaning behind all of this. This process is discriminating against such people. Some form of independent unbiased program should be established (work-shops) in poor affected communities to provide them with easy to understand factual information (in their own language) to assist them in developing their own opinions which will allow them the opportunity to comment during the comment period. Such a system should have been in place well in advance of the actual notices for comment going into papers."

If Ninette Potgieter really believes that the majority of people living in the townships will be interested in what goes on in the outside world, when their protests against the government and municipalities for lack of service delivery are their major current concern and which will remain so for a long time, then the niceties of human nature have obviously escaped her. Without being facetious, there would need to be a number of Julius Malema clones required to present such information meetings, if there is to be any hope of gaining the attention of township residents away from the subject principally in their minds - the lack of service delivery.

But gaining the attention of these township dwellers is only one aspect. With their lack of educa-tion and sophistication, in what way could they be easily informed in very simple terms about such a highly complex subject? Any such exercise would be very likely to deteriorate to a politi-cal issue. And who would be paying the costs of such an enormous campaign? Where are all the knowledgeable lecturers going to be found to carry out the task in a few months?

The world is, of course, full of idealists, but whose ideals all too often demonstrate a lack of prag-matism. In a modern first world, Ms Potgieter's ideas may be highly practicable, but not in a country in which, in fact, a large fraction of the population are third world. Pursue this idealistic philosophy of wide communication to its limit and at great expense, and nothing would be achie-ved, in fact. No developments whatsoever would ever occur. The practicality is, therefore, that final decisions would remain in the hands of a few leaders whom, it can only be hoped, have high ideals in mind for the benefit of their populations. All too often in undeveloped countries there are no leaders with the insight to even be able to see the need to uplift their peoples, only to suppress them for personal gain.

The type of progress and population upliftment which needs to be carried out in undeveloped countries depends entirely on the highest level of integrity in a country's leaders. But repressed populations will only respond if their basic service needs have been properly dealt with. To suggest that such populations in South Africa are being discriminated against in respect of this particular Eskom EIA process for the purpose of increasing the electrical generating capacity of South Africa is not helpful.

Response (69)

The public participation process is being conducted as required by legislation. The adverts are published in national, provincial and local papers. Advertisements are placed at libraries, community halls or areas where there is public access. A number of meeting with interested and affected parties are held.

Your comment (70)

Submission 8b from TAG, quoting from Additional Specialists Reports on p.11 - "Underground and undersea high voltage power lines – investigation of all aspects, ranging from detailed ter-rain analysis, construction, site rehabilitation, health matters, feasibility aspects, etc".

Costs, of course, would be a very important consideration for underground or undersea high vol-tage power lines, even if such power cables are available to carry 765 kV. A major safety aspect of putting such super-high voltage power lines underground or along the seabed is the possi-bility of them being inadvertently disturbed and damaged by some means, which then transmits the power, say to a mechanical digger on land or a ship at sea, and electrocuting people. Tele-phone cables don't present this sort of hazard because they don't carry high voltage signals.

Response (70)

Comment noted.

Your comment (71)

Submission 8e from TAG, quoting from the 3rd paragraph – "One 4 000MW nuclear power station like 'Nuclear -1' has a capital cost of about R120 billion (or 30 million per MW). With an availability factor of 70% it would be available by 2018 at the earliest. One nuclear power station alone is not reliable, however. In the event of a shut-down, all 4 000MW capacity is shut down".

This wording shows just how badly the situation on power output has been misunderstood. There are no reactors anywhere in the world with an output of 4 000 MW(e), the highest at the present time being the French Areva EPR with 1 600 MW(e). The largest output Westinghouse AP 1000 is 1 250 MW(e). As I have previously mentioned, the 4 000 MW output is the total output of a *single* nuclear reactor providing a generating capacity of 1 600 MW(e). Ideally it should be ex-pressed as 4 000 MW(t) per nuclear reactor. Therefore, in order to obtain a total generated output of 4 000 MW(e) for one power station, in this case Nuclear-1, the station will require a minimum of *three* nuclear reactors. The objection of the TAG, therefore, falls away in these circumstances.

Response (71)

Comment noted.

Your comment (72)

Submission 14a from Amanda and Charles Laubscher, quoting from their CANE response on p.4 – "CANE: this is a red herring, designed to obscure the scientific facts. We are NOT talking about background or external radiation: we are talking about man-made INTERNAL DOSES of ionizing radiation".

It is very easy to consider this matter a red herring, but that opinion is misguided. For example, uranium is ubiquitous in the environment and it is unavoidable that human beings are continually subjected to an intake of uranium compounds, albeit in very low concentrations. This isn't in any way a red herring: uranium nuclides are all radioactive, although they have very long half lives. They emit fairly high energy alpha particles which, because of their mass, are unable to move very far in tissue. Therefore all their energy is lost within a few microns from where they origin-nated in the atom of a decaying radionuclide, which causes very localised massive tissue dam-age, but only within a few microns from where the alpha particle originated.

Another point to note is that, with the exception of neutrons, ionizing radiations in the natural background don't differ in any way from the ionizing radiations which are emitted by all radio-nuclides. Thus we are exposed to alpha, beta and gamma ionizing radiations over a wide energy spectrum, whether from natural background (both from terrestrial and cosmic origin) or from radionuclides in the environment. Because alpha particles cannot penetrate the skin, any internal alpha radiation exposure from the background can only occur from the minute intake of the naturally occurring uranium.

The matter of ionizing radiations occurring from internal sources of radionuclides is a subject which has exercised the ICRP for decades, with their recommendations on limits for concentra-tion released into the environment which, for any intake, can't lead to tissue radiation doses which would lead to cancers to any greater extent than what arise from exposure to the ionizing radiations from the natural background.

It is a fact that, except for a small number of radionuclides which are either specifically attracted to body organs or otherwise retained for long periods – for example I-131 to the thyroid; Pu-239 (an alpha particle emitter) and Sr-90 to bone; and insoluble particulates in the lungs – most are relatively evenly distributed throughout the body by the blood. They then become whole body beta / gamma ionizing radiation emitters, radiations which are effectively no different to exposures from external sources of these radiations. Such radionuclide body burdens are rapidly excreted. And because most of the radionuclides likely to be encountered in minute amounts in the environment are beta and gamma emitters, these ionizing radiations are moderately penetra-ting in tissue for beta particles, and highly penetrating in the case of gamma radiation.

All necessary safety measures are adopted in nuclear reactor designs and their ancillary plant to limit the releases of radionuclides into the primary coolant and possibly into the secondary cool-ant. These releases include leakages from the primary coolant into any ancillary plants through which small amounts flow, and liquid aliquots removed for analytical purposes. These liquid samples require to be disposed of and, providing the content of any radionuclides is below the ICRP recommendations for such releases, they are released into the waste water drains. This water is continuously diluted as it is mixed with water from a multiplicity of sources, such as would be in the case of a comprehensive sewage system, on its way to a sewage plant.

HEPA filters are used to prevent radioactive particulates escaping into the atmosphere, but these filters aren't completely 100% efficient in their retention. A better alterative would be to use more efficient filtering membranes. However, the more efficient the membrane is so is a greater area required to pass the same amount of air per unit time at the same pressure differential. Increas-ing the filtration efficiency increases the air resistance through the filter.

Response (72)

Comment noted.

Your comment (73)

Ditto, p.4, quoting the 2nd CANE comment – "No independent epidemiological studies have been done on the cancer rates before the and after Koeberg was switched on. *[sic]*"

These studies are not generally carried out at nuclear sites. Arguably such studies should be carried out over the period of reactor operations. However, nuclear siting is not usually carried out decades in advance of the mere possibility that a nuclear power station will be constructed on a particular site, so to start control investigations for, say, childhood leukaemias just isn't practica-ble. However, although the land for some of the proposed Eskom nuclear power station sites was purchased some decades ago, the status of carrying out prior control epidemiological studies hasn't yet been internationally recognised.

At distances out to 10 km from Koeberg, radioactivity has never been detected which could be attributed to anything actually unknowingly escaping from the Koeberg nuclear plants. Planned releases either go into the sea ~~or in the outflow to the Duynefontein sewage plant~~. However, there remains clear evidence of the continued, but ever reducing, fallout of the relatively long half life Sr-90 and Cs-137 from the above-ground atom bomb tests, the last one of which was carried out few decades ago.

Response (73)

The workers go for routine medical checks. The results from environmental sampling are submitted to the NNR for compliance.

Your comment (74)

Ditto p.4, last CANE comment on the page – "This is a completely irrelevant red herring. [This relates to an Eskom response to a previous point made by CANE in which Eskom referred to the radiation exposure being measured in microSieverts per annum]. We would like to know about the projected output of Strontium-90 and Caesium-137 in Becquerels per annum INDEPEN-DENTLY VERIFIABLE by reference to existing technology such as the proposed AP1000 and EPR reactors."

It is not helpful of CANE declaring a red herring and invoking another one in response. Presum-ably the new – or, more appropriately, uprated - PWR technology embodied in the AP1000 and EPR designs will even further reduce the Sr-90 and Cs-137 emissions than for the previous gen-eration of PWRs. However, the fact remains that the predominant deposition of these two radio-nuclides arises from the fallout from the airborne remnants in the atmosphere from all the above-ground atom bomb tests. As far as I am aware, the deposition data for these two relatively long lived radionuclides have remained pretty well uniform over the surface of the globe.

However, no examples of these two new uprated PWR designs have yet been commissioned and become operational, those presently in existence still being under construction with some years ahead before they go critical. Therefore radioactive release data won't start to become available from them for a number of years.

Response (74)

Eskom has not decided on the specific PWR vendor technology yet.

Your comment (75)

Submission 14b from Earthlife Africa (ELA) – in the 2nd paragraph it is suggested that Cs-137 is a "well known carcinogen", together with Sr-90 and I-131. However, unlike the latter two radionuclides which are specifically concentrated in the bone and thyroid, respectively, caesium, being an alkali metal like sodium, rapidly becomes evenly distributed throughout the body, and is for this reason rapidly excreted. It is not in any way a specific carcinogen. The function of potassium – which caesium apparently mimics – is not confined to specific body organs.

Ditto, quoting form the 2nd paragraph – "This section concludes with a short refutation of the argument that higher levels of Strontium-90 and Cesium-137 in the vicinity of KNPS are attributable to above-ground nuclear weapons testing in the 1960s and 1970s".

I haven't seen the reports that were provided to ELA by the Koeberg Environmental Survey Lab-oratory. I find it strange that they would have refuted the fact that long lived products are not attributable to have arisen from the above ground atom bomb tests carried out in the 1960s and 1970s. It is unfortunate that the ESL reports haven't been attached.

Although I don't recall the details, now, some years ago there were questions about radioactive materials being dumped at the Vissershok city waste disposal site. A firm in Picketberg was brought in to carry out measurements of radioactivity in order to identify what radionuclides were present. Sr-90 and Cs-137 were detected in amounts which could not possibly have arisen from Koeberg, considering the distance and dilution which would have occurred. It was concluded that these

radionuclides were from the remnant fallout from the above ground atom bomb tests. There shouldn't be any difference in the soil at Koeberg, at least which hadn't been disturbed.

Ditto, p.15, quoting the 3rd paragraph - "Of the total 188 Mt of fission products to the atmosphere *[sic]*, 160 Mt went into the stratosphere of the northern hemisphere [rarely penetrating below $10^{O}$ S] and 18 Mt into the northern troposphere. The corresponding releases to the atmosphere of the southern atmosphere were 8 Mt and 2 Mt, respectively."

There's clearly something wrong with the units given for releases of fission products into the atmosphere from the above-ground atom bomb tests. I would guess that at most a total mass of highly enriched U-235 and separated Pu-239 used in all these tests would barely have reached 2 tonnes, let alone megatonnes – Mt! The radioactivity released into the atmosphere expressed in Becquerels would, of course, be very high, certainly reaching MBqs.

The explosive power of atom bombs is expressed in megatonnes, Mt (or Mte), but that refers to the *equivalent explosive power* that one would get from that weight of TNT. The units as given in this ELA report need to be reviewed – they are clearly wrong. It would be normal to express the release as an amount of radioactivity expressed in MBq. Basically, the Mt TNT equivalent output for an atom bomb has been confused with its actual fissile uranium / plutonium content. A little thought should have give the authors the right clue: how does one move around objects weigh-ing megatonnes? How large would they look?

Response (75)

Comment noted.

Your comment (76)

Ditto, p.16 quoting clause 1 – "The maximum possible value for ground-level radioactivity in one square metre of Strontium-90 in the southern hemisphere from above-ground nuclear weapons testing is therefore 37 000 Becquerels (37 X $10^6$ Bq per $km^2$ divided by $10^3$)."

1 square kilometre = $10^3$ x $10^3$ = $10^6$ sq metres, not $10^3$. Bearing this in mind, the amount of radioactivity per square metre is *1 000 times less* than what the author states, which will make a great deal of difference to his arguments. As they stand, therefore, all his following conclusions are invalid (based on activities 1 000 times higher than is the actual case).

Ditto, quoting from the paragraph immediate before section 6.1 – "While we would accept the challenges of a minimal influx of these isotopes due to weapons fallout and intermittent dischar-ges from Koeberg Nuclear Power Station, it is our contention that the quantity of Caesium-137 in particular, and its obviously associated risk from Strontium-90, pose an unnecessary threat to the population of the South-Western Cape".

The comment about the "un-necessary threat to the population of the South-Western Cape", based of data collected near the Koeberg site doesn't take into any consideration the wind direc-tion and dilution with distance. Both these factors would ensure that, with distance, activity levels would be very considerably reduced from the already minute amounts (remembering the incorrectly enhanced figures given above).

Ditto, quoting from the 1st paragraph after the tabulated data at the top of this page – "We feel that any amount of extra long-lived radioactive isotopes is too many, so 40 billion extra Becquer-els of Cesium-137 annually is unacceptable. With a half-life of 30 years, this amount can quickly accumulate to hundreds of billions of Becquerels over 20 years."

There has been no attempt to equate the claimed Becquerel figures with the practicality of their wide dispersion over a very large area, nor any comments on how these radionuclides are re-moved from the environment by natural forces, particularly rainfall, plus their natural radioactive decay processes.

General comment on this submission: I am sure that there are other aspects in this report which could indicate yet further misunderstandings in the interpretation of the data which was given to the author, who has acknowledged that he isn't an expert any way. It is, of course, perfectly reasonable for Earthlife Africa to have had such a report prepared, but it wasn't in their interests at all for credibility to have issued it without getting some sympathetic radiological expert to carefully check through it first. It's known in specialist spheres as "peer review".

Response (76)

Comment noted.

Your comment (77)

Submission 14d Working Group of the Consultative Exercise on Radiation Risks in Internal Emit-ters (CERRIE), quoting from the final paragraph – "Given the conflicting results on the effects of radiation on human germline minisatellite instability, more work is clearly needed to validate the potential applications of minisatellite loci for monitoring mutation rate in human populations."

This is a highly specialist research report, which really needs help from a specialist in germline mutations to help with its interpretation for the layperson. However, the final sentence which I have quoted is quite unequivocal where the required validation was concerned at the time the report was published. Unless there are later reports with more data to validate the thesis of ioniz-ing radiation causing germline mutations, no firm conclusions can be drawn from this particular report.

Submission 14e "Radiation damage may be passed to offspring", quoting the first paragraph – NEW YORK (Reuters Health) - The harmful effects of radiation may be passed down from one generation to the next, researchers report. In a study in mice, the offspring of male mice that had
been exposed to radiation had an increased number of genetic mutations, as did their offspring -
even though the two generations of younger mice had not been exposed to radiation. The pas-sing down of these mutations could increase the risk of genetic disorders in later generations, according to the report published in the May 4th issue of Nature."

This is a very interesting statement, particularly for what it doesn't have to say rather than for what it does say. The general approach to the genetic effects of ionizing radiations is that they are harmful to genes and DNA. But all animal and plant species have evolved through a contin-uum of background ionizing radiations, and there's no way that a number of ionizing direct hits on DNA double helices won't breaking the highly complex organic molecules in one or more places along their long molecular chains. Did evolution make use of those very ionizing radia-tions to cause mutations, making sure that some % of them would be beneficial to the specific species? Assuming that natural repair mechanisms also evolved in parallel, are the majority of mutations identified as foreign bodies to be destroyed if non-viable reconnections are made? And if beneficial reconnections are made, how are these identified by the body?

Or what other vector did evolution devise to break genes in such a way that they would repair in modified form, and which were not only viable but were of benefit to the specific species of living organism?

In all the experiments which have been conducted on the effects of ionizing radiations on animals, have any of them identified mutations which could be *beneficial* to the species? Are some of the mutations relatively minor, but still beneficial, the effects of which are so subtle that they haven't been

identified? Or is it possible that they haven't been identified for the very reason that the research workers adopt a mindset that ionizing radiations can only cause harmful gene and DNA changes? Or have they only actually looked for deleterious changes in the developing organisms, without even considering the possibility of beneficial outcomes?

There are so many unanswered questions. But the main thrust of my argument is that not all mutations will be damaging to the species involved: many must surely be beneficial. All existing living animals and plants will necessarily have to continue to be able to withstand any over-whelming deleterious effects from the natural background ionizing radiations

Maybe some really flexibly-minded geneticist has written a thesis about this very subject, but if so then I have never come across any references to any reports dealing with this beneficial aspect of mutations.

Response (77)

Comment noted.

Your comment (78)

Submission 14f, dealing with the effects of increasing exposures to ionizing radiations - General comments: I must make it clear that I would expect the intensity of the ionizing radiations which may result either in potentially beneficial mutations or harmful ones not to extensively exceed what occurs from exposure to the natural ionizing radiation background, maybe limited to a factor of approximately 50 to 100 times higher. Clearly above some upper threshold, massive tissue damage will result, with amounts of toxic organic breakdown products being produced which normal body mechanisms are either able to detoxify, when the irradiated individual will recover, or the cellular damage is too extensive, and the irradiated individual will inevitably die from organic toxic poisoning.

Submission 16b from Ms Christine Garbett, quoting Section 1.19 – "This response is not addressed adequately and is factually incorrect. [Unfortunately the response hasn't been quoted, so I don't know exactly what it was in detail. However, I assume that it related to using other energy sources for generating electricity than nuclear]. Hundreds of thousands of sustainable unskilled & semi-skilled jobs will be lost if nuclear power is preferred over a mix of renewable energy. This is, not only an economic tragedy, it is a matter of preventable human rights abuse to deprive the struggling class of their right to work."

How the estimate was made for the claimed 100 000s of jobs being lost if the nuclear project goes ahead, isn't mentioned – where did this figure (guesstimate?) come from? In fact, jobs cannot be lost which have never been created. With the full nuclear programme, many profess-sional and technical / technological posts will be created which would never exist at all if the nuclear programme was to be cancelled. South Africa would lose a great deal of its high-tech professional potential. To have such highly nuclearly trained staff would definitely put South Africa on a par with other countries with substantial nuclear programmes.

The other fact is that, of the total of ~40 000 MW(e) required by 2025, ~20 000 MW(e) of it will indeed be non-nuclear. These latter power stations will attract some highly qualified professional staff at management level. But how many such people will be required to run a wind or solar con-centrating power station control room? – and what cadre of technical maintenance staff will be required at each power station? Assuredly not a large number. So the whole idea of 100 000s of potential employees remaining out of work falls away as failing to consider the reality of the situation.

Interestingly, up to the present time, Eskom has used contract staff during shutdown mainten-ance on its two PWRs at Koeberg. This was primarily because to have had full time specialist employees would have been costly and impracticable because there would be no suitable work for such

employees between refuelling and maintenance shutdown periods. However, with its considerably expanded nuclear programme, I would anticipate in the future that there would be full justification for Eskom to have it's own full-time specialist employees, who would be deployed to whatever nuclear power station had a reactor down for refuelling and maintenance.

The exaggeration in numbers arises simply because there's so much prejudice against nuclear power that sheer pragmatic thinking is thrown out of the window. And every time that lack of pragmatism lends itself to be challenged.

Response (78)

Comment noted.

Your comment (79)

Ditto, Section 1.10, quoting - " - - - Chernobyl is a well known case of people dying and becoming ill from living close to a nuclear power station. There are many other documented cases of health problems associated with routine nuclear emissions and various other nuclear accidents"

There were no specific problems at the Chernobyl nuclear power station until the disaster with reactor No.4, which led to the massive release of radioactive fission products into the surround-ding inhabited countryside and towns downwind. This rapidly required the evacuation of 10 000s of the local population. There is no comparison whatsoever with a normal operating nuclear power station.

Response (79)

The Chernobyl reactors have different plant designs from those that are being proposed for the Nuclear-1 EIA. The RBMK reactor is a pressurised water reactor with individual fuel channels and use graphite as a moderator. Unlike the Chernobyl reactor the proposed Nuclear-1 reactors will have a negative reactor coefficient (reactivity changes with temperature).

Your comment (80)

Submission 19a from Ingela Richardson with an article by Magnus Linklater "Who says nuclear is clean?", quoting the 4th paragraph on p.2 - "They say that at the present rate of use, worldwide supplies of rich uranium ore will soon become exhausted, perhaps within the next decade. Nuclear power stations of the future will have to rely on second-grade ore, which requires huge amounts of conventional energy to refine it. For each tonne of poor-quality uranium, some 5,000 tonnes of granite that contains it will have to be mined, milled and then disposed of. This could rise to 10,000 tonnes if the quality deteriorates further. At some point, and it could happen soon, the nuclear industry will be emitting as much carbon dioxide from mining and treating its ore as it saves from the "clean" power it produces thanks to nuclear fission."

The date of this article would appear to be late 2007.

The comments in this paragraph ignore the fact that nuclear technology advances apace – this fact hasn't even been graced with a mention. New reactor technologies are being looked at, now, to see how they can utilise the uranium and heavy elements separated from spent fuel elements using new nuclear reactor principles, especially fast breeder reactors. And other technologists are looking at reactor systems which can be used to reduce fission products largely to non-radioactive nuclides. Then there's another naturally occurring element, Th-232, which, although itself not fissile, can be converted to fissile U-232 in fast breeder reactors. In fact this radionu-clide is more abundant than uranium. Thus the assumption that the nuclear industry will be needing to look for the winning of uranium from ever less concentrated ores and other sources falls away. There's enough unused uranium isotopes plus the heavy actinides in spent fuel elements which can be used in fast breeder

reactors to keep the nuclear generating industry on stream for possibly the next 150 to 200 years, possibly longer, without even tapping Th-232.

It is unfortunate that the writers of the article are unable to bring some flexibility into their negative arguments against nuclear power. Thus through their inflexibility they are unable to recognise the simple fact that coal used in coal fired power stations is still by far the most com-mon form of energy source in the world. Therefore it isn't at all surprising that much of the multi-plicity of tasks from mining ores to the actual nuclear reactor construction work are carbon-emitting processes. It is tantamount to being a dishonest strategy. And this intellectual dishon-esty becomes obvious when the situation is conveniently ignored that exactly the same carbon-emitting processes are involved up to and including the construction of wind generators and their towers, and solar powered facilities, whether the simple domestic hot water type or solar concentrating installations for 100 MW output power stations. There's no escape from that situa-tion until by far the greater percentage of power is generated by non-carbon emitting primary energy sources.

Response (80)

Comment noted.

Your comment (81)

Submission 20 by Rod Gurzynski, EcoProgram

Comments on p.1, 3rd paragraph to the top of p.2 - Wind is definitely intermittent. The driving propellers have to be stopped at low wind speeds, otherwise the frequency can't be maintained, and be feathered to stop at high speeds because of propeller vibrations which could destroy the generator. Experience with Eskom's three wind generators at Klipheuwel show an efficiency of about 16%, and the EIA process for their 100 MW installation up the west coast mentioned an expected operational figure of 26%. The time down in both cases represents actual no-generation states. Therefore wind generation is indeed intermittent. Solar concentrating relies on sufficient heat being stored in the very hot molten salt storage tank to maintain generating capacity throughout the periods of dusk, darkness and dawn.

PWRs do not have a positive coefficient of reactivity through any part of their power range, unlike the three RBMK reactors of totally different concept still in operation at Chernobyl and elsewhere in Russia. The power output of PWRs is, therefore, variable, with a negative reactivity coefficient being maintained throughout their power range.

Comments on p.2, 2nd paragraph: for the new nuclear power stations, each one will be required to produce ~4 000 MW(e). Because there are no PWRs with an output greater then 1 600 MW(e), every new nuclear power station will, therefore, have at least three nuclear reactors, each reactor with a *total* energy output of ~4 000 MW(t). The matter of reliability causing the shutdown of the total electrical generating capacity from one nuclear power station therefore falls away. Genera-ting flexibility is thus ensured for maintaining output capacity and being able to vary it over quite a wide output range, with no nuclear safety issues being involved.

Comments on p.2, 3rd paragraph: the misunderstanding here is that the total power output of one of the new PWRs, of the order of 4 000 MW(t,) has been confused with their electrical output. In the case of the two reactors at Koeberg, each one has a maximum output of 918 MW(e). For a nuclear power station with two or more nuclear reactors it would be unusual for all of them to be shut down simultaneously. Other than when there are peak demands, the excess power from one reactor can be used to provide the low shutdown power requirements of another nuclear plant, otherwise the Atlantis CCGT plant would be used to provide the necessary power requirements. A similar situation would apply at any of the future nuclear power stations, serviced with their own nearby CCGT power stations.

Response (81)

Comment noted.

Your comment (82)

Comments on p.2, 4th paragraph: decommissioning *and dismantling* won't be necessary for a minimum of 60 years after the reactors first go critical. We have the commonality of a require-ment being requested by a number of I&APs who have jumped on the bandwagon, expecting some genius to appear who will be able to accurately predict exactly what the situation will be in 60 years time; to be able to forecast exactly what the latest technology will be available all those years into the future both for dealing with spent fuel elements and other radioactive wastes. Indeed, whatever long term operational experience is gained through those 60 years for these new PWR types now being considered, their lifetimes could well be extended *beyond* 60 years. It is obviously very important for this EIA process for these I&APs to recommend to the facilitators an individual whom they know will be able to carry out this exercise to their satisfaction.

Response (82)

Comment noted.

Your comment (83)

Comments on p.2, 5th paragraph: the greenhouse emissions during the life of the reactors will be mainly associated with plant components which may require to be replaced, and the manufacture of new fuel elements. However, this does absolutely no justice to the fact that, as the decades progress from now, as ever more nuclear and renewable power stations are brought on stream this will lead to the phasing out of coal, gas and oil fired power stations. Thus their carbon emis-sions will continually fall. Therefore to equate the carbon emission that has been calculated, now, to apply throughout the whole 60 years operating life for these reactors is quite unjustified. Unless, of course, these I&APs can provide positive proof that the carbon emissions for all the ancillary; maintenance; replacement; and refuelling processes will never fall over that period of time, despite the phasing out of carbon-emitting power generation.

Response (83)

Nuclear energy compared with other energy sources produces low levels of carbon dioxide emissions in its complete life cycle. It is closely comparable with renewable energy sources such as wind, solar and hydro.

Your comment (84)

Comments on p,2, last paragraph – whether the PBMR will go ahead in South Africa has now become a moot point. The most unfortunate aspect is that experience in it's use for the energy economic production of hydrogen for the future non carbon-emitting energy source for motor vehicles will be un-necessarily delayed. A number of such motor vehicles are currently on test in the USA, but the hydrogen being used is produced by the very energy-intensive electrolytic process. The PBMR (Pty) Limited company doesn't appear to have been successful, yet, in attracting an international group willing to finance its demonstration PBMR.

Comment noted.

Response (84)

Submission 21b  Nuclear programmes in the world

Your comment (85)

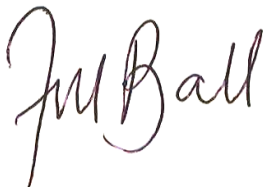
I see that the data were prepared by WNA and published on 01/02/2009. I would have thought at that even at time to suggest zero planned nuclear reactors under consideration for the UK wasn't correct. The UK is currently looking at a minimum of 10. South Africa is claimed to be looking at 3 new nuclear reactors. However, although this may be the situation with this current Nuclear-1 EIA process to generate ~4 000 MW(e), which was modified from an earlier EIA process for 4 or 5 nuclear power stations to generate a total of 20 000 MW(e) by year 2025, the latter fact indicates that a lot more than three nuclear reactors will eventually be constructed.

Response (85)

Comment noted.

Should you have any queries with respect to the above please do not hesitate to contact Arcus GIBB.

Yours faithfully
For Arcus GIBB (Pty) Ltd



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Jaana-Maria Ball
Nuclear-1 EIA Manager