

**From:** Meraj Rahimi  
**Sent:** Thursday, May 14, 2009 9:31 AM  
**To:** GRANDHOMME Catherine (TN International);  
Michael.Conroy@dot.gov  
**Cc:** GARCIA Vanessa (TN International); Putz Francis (TN  
International); Zhian Li  
**Subject:** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

Catherine,

Yes, I mean Chapter 3.6.1. I believe the calculations in your SAR can be used as the basis for surface transport with keff criteria of 0.95. However, it appears that for content 11 air transport, you still don't have a calculation that shows the maximum fissile mass for U235 with k of less than 0.95. Although, in paragraph 8.2 of Section 3.6.8 you show a k of 0.983 for 7 kg of U235, and you make the argument that APOLLO2-MORET IV normally over-estimates ( by 6,000 pcm) in the presence of a significant thickness of steel when used as a reflector. Using TRIPOLI4, you argue that k is 0.915. Yet, in Paragraph 7.2.1 of Section 3.6-1, you indicate that APOLLO2 - MORET IV under-estimates the k for U bare metal or reflected by water. I guess because of these arguments we just decided last time to restrict the air transport to 5 kg based on our calculations.

With respect to E7 spacer, I was asking the 3.5 kg limit which had been imposed by us in the year 2000.

thanks,

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**From:** GRANDHOMME Catherine (TN International) [<mailto:catherine.grandhomme@areva.com>]  
**Sent:** Wednesday, May 13, 2009 6:54 AM  
**To:** Meraj Rahimi; Michael.Conroy@dot.gov  
**Cc:** GARCIA Vanessa (TN International); Putz Francis (TN International); Zhian Li  
**Subject:** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

Meraj,

[Concerning the 5.5 kg mass limit](#) for both surface and air transport, we suppose that you mean Chapter 3.6.1 and not Chapter 3.6.8. In Chapter 3.6.1, calculation results are presented in paragraph 5.4.1.1 for two different masses (7 kg and 5.5 kg), both in the same conditions and

in the same penalizing configuration (network of 5N packages). The phrase "rough guide" is a "rough" translation of what is written in the French SAR: it should actually mean "for information purposes ", since the 7 kg mass limit is acceptable to French competent authorities, and the 5.5 kg calculation results are thus presented in the SAR "for information purposes " (and for use by foreign competent authorities).

Finally do you find these results relevant to conclude that the limitation of 5 kg U235 for both surface and air transportation is acceptable ? do you need additional calculations anyway ?

Concerning spacer E7 in TN-90 container, as shown in Figure 11.1 of French certificate (Iak), spacer E7 is both a container and a spacer, which can fit into the TN 90 container. TN 90 container internal diameter is 120 mm, E7 container internal diameter is 60 mm. So, in case of use of TN 90 container in TN BGC-1 packaging, content 11 is bounded in a much smaller internal diameter using E7 spacer inside TN 90 container, leading to higher authorized masses for surface transport in French certificate (15 kg U235 using (TN 90 + E7) instead of 7 kg U235 using only TN90 container, see Chapter 3.6.8 for the demonstration). For information, spacer E7 is not used in case of others containers (AA204, or AA203, or AA41), as mentioned in paragraph 2 of content 11 of French Certificate. Moreover, as defined in the previous US certificate, content 11 was restricted to material within a TN-90 secondary conditioning container.

The letter P corresponds to the non proprietary version of SAR but it does not make any differences.

catherine grandhomme

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**De :** Meraj Rahimi [mailto:Meraj.Rahimi@nrc.gov]

**Envoyé :** lundi 4 mai 2009 20:33

**À :** GRANDHOMME Catherine (TN International); Michael.Conroy@dot.gov

**Cc :** GARCIA Vanessa (TN International); Putz Francis (TN International); Zhian Li

**Objet :** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

Catherine,

The calculations in 3.6.8 (5.5 kg U-235) could be a basis for the bounding fissile mass limit for surface and air transport. Section 5.4.1.1 in 3.6.8 use the phrase "rough guide." How rough was the 5.5 kg calculated?

When I examined our Safety Evaluation Report from the year 2000, it had placed a limit of 3.5 kg if spacer E7 is not used in TN-90 with Content 11. Your current CoC still states the need for E7 spacer. How does the absence of these spacers affect the criticality? What about other containers (e.g., AA 204, AA 203, etc...).

The version of the SAR which we received last time was:

TRANSNUCLEAIRE

Ref- 9990-Z-P, Rev.: 10

PUBLIC SAFETY ANALYSIS REPORT

Date: September 12, 1997

TYPE B(U) F PACKAGE MODEL CONSTITUTED BY THE

TN-BGC1 MODEL PACKAGING LOADED WITH VARIOUS CONTENTS

Apparantly the letter "P" is included in the version that we have. I don't know if that makes any difference.

thanks,

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**From:** GRANDHOMME Catherine (TN International) [<mailto:catherine.grandhomme@areva.com>]  
**Sent:** Thursday, April 30, 2009 4:08 AM  
**To:** Meraj Rahimi; [Michael.Conroy@dot.gov](mailto:Michael.Conroy@dot.gov)  
**Cc:** GARCIA Vanessa (TN International); Putz Francis (TN International); Zhian Li  
**Subject:** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak  
**Importance:** High

Meraj,

There are 2 different criticality studies for content 1 : chapters 3.6.1 and 3.6.8.  
In chapter 3.6.1 (CEA report, EMB TNBGC PBC NTT CA000481A) : The study is really done for ACT with 5N (damaged) packages (with N=50) instead of 2N in order to cover 5N (damaged) package array in CNT . This study is done with a internal arrangment of 120 mm diameter with 7 kg U235 and 5.5 kg U235. The results are  
- For 7 kg :  $K_{eff} + 3 \text{ Sigma} > 0,95$ .  
- For 5.5 kg :  $K_{eff} + 3 \text{ Sigma} < 0,95$

The study with 15 kg U235 comes from chapter 3.6.8 of SAR. This study is done with a internal arrangment of 100 mm diameter, with 2N packages array (N=16). The results are  $K_{eff} + 3 \text{ Sigma} > 0,95$ .

Do you find these results relevant to conclude that the limitation of 5 kg U235 for both road and air transportation is acceptable ? do you need additional calculations anyway ?

Concerning the list : you wrote 9990-Z-1-6 rev 4 : this reference corresponds to the chapter 9990-Z-1-6 and not to the global SAR reference. I join the summary of revision 10 of SAR : can you check if it corresponds to the SAR revision NRC had ? in this case the chapter 9990-Z-1-6 is revision 3 and not 4.

catherine grandhomme

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**De :** Meraj Rahimi [mailto:Meraj.Rahimi@nrc.gov]

**Envoyé :** mercredi 29 avril 2009 17:19

**À :** GRANDHOMME Catherine (TN International); Michael.Conroy@dot.gov

**Cc :** GARCIA Vanessa (TN International); Putz Francis (TN International); Zhian Li; Zhian Li

**Objet :** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

Catherine,

I assume you mean 2N(damaged) packages (with N=50), the keff + 3 Sigma is less than 0.95. Since you increased the array size and set the keff limit to a lower number (i.e., 0.95), the allowable mass limit decreased from 15 kg to 5.5 kg. As you indicated, this will be bounded by the 5.0 kg restriction which we will impose both for surface and air transport.

With respect to having the list next week, it's fine with us knowing that it will reduce the chances of accommodating you for the June shipment if there are no significant changes to the design. If there are significant changes to the design other than content, this one week delay may not have any significant impact, since we have to perform additional reviews in the other areas and will not be able to support the June shipment anyway.

thanks,

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**From:** GRANDHOMME Catherine (TN International) [mailto:catherine.grandhomme@areva.com]

**Sent:** Wednesday, April 29, 2009 9:41 AM

**To:** Meraj Rahimi; Michael.Conroy@dot.gov

**Cc:** GARCIA Vanessa (TN International); Putz Francis (TN International)

**Subject:** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

Mike, Meraj

Following our phone conference of April, 22nd:

1. Regarding the TN BGC-1 criticality analysis for content 11 (U metal), in case of road transport, in chapter 3.6.1 of TN BGC-1 Safety Analysis Report (CEA report, EMB TNBGC PBC NTT CA000481A), in paragraph 5.4.1 (U metal, 100 % U235), we found some interesting criticality results.

For a mass of 5.5 kg of U235, in case of an array of 5N (damaged) packages (with N=50), the Keff + 3 Sigma (Sigma= 0,002) is below the 0.95 criterion.

Do you find these results relevant for your criticality assessment, keeping in mind that the U235 mass will finally be limited to 5 kg, due to your proposal for mass restriction in air transport?

Please inform us quickly if these results are not relevant.

2.TNI has to provide in a short time a list of modifications in SAR since the last version given at NRC (since 9990-Z-1-6rev4), in order for NRC to review only criticality analysis.  
Due to easter holidays in France, TNI can not provide this list before the end of week 18.  
TNI will try to provide it for the week 19. Is it acceptable for NRC to wait one more week ?

catherine grandhomme

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**De :** Meraj Rahimi [mailto:Meraj.Rahimi@nrc.gov]  
**Envoyé :** vendredi 24 avril 2009 19:23  
**À :** GRANDHOMME Catherine (TN International); Michael.Conroy@dot.gov  
**Cc :** GARCIA Vanessa (TN International); Putz Francis (TN International)  
**Objet :** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

The action items are correct.

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**From:** GRANDHOMME Catherine (TN International) [mailto:catherine.grandhomme@areva.com]  
**Sent:** Friday, April 24, 2009 11:41 AM  
**To:** Meraj Rahimi; Michael.Conroy@dot.gov  
**Cc:** GARCIA Vanessa (TN International); Putz Francis (TN International)  
**Subject:** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

Mike, Meraj,

we thank you for your availability for our conference call dated of 22nd of April.

hereafter the actions decided in this conference call. Please confirm if our understanding was correct or not:

TNI has to provide in a short time a list of modifications in SAR since the last version given at NRC (since 9990-Z-1-6rev4). In this case NRC will review only criticality analysis.  
If TNI can not provide this list or can provide this list but too late, then NRC will do complete review of SAR.

After meeting : TNI will try to provide this list before the end of week 18.

content 11 :

- criticality for road transport : TNI has to provide new calculations in respect of criterion of 0,95 and to give ISC.

- criticality for air transport : NRC proposal is to limit weight of U235 to 5 kg and weight of water in hydrogeneous material to 2000g. TNI accepts this proposal.

catherine grandhomme

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**De :** Meraj Rahimi [mailto:Meraj.Rahimi@nrc.gov]  
**Envoyé :** mercredi 22 avril 2009 16:11  
**À :** GRANDHOMME Catherine (TN International); Michael.Conroy@dot.gov  
**Objet :** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

What we would like to discuss are:

1. Changes to the design, analyses, and assumptions in the areas of structural, materials, containment, shielding, package operation, fabrication, and maintenance since the issunace of Safety Analysis Report, 9990-Z-1-6, Rev. 4.
2. The use of 0.95 for k-effective for determining the array size.

The conference call is set up for 11:00 a.m. (eastern U.S. time), and the bridge line to dial is 301-415-7026 or the toll free 888-455-3620. The passcode is 69208.

thanks,

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**From:** GRANDHOMME Catherine (TN International) [mailto:catherine.grandhomme@areva.com]  
**Sent:** Wednesday, April 22, 2009 9:43 AM  
**To:** Michael.Conroy@dot.gov  
**Cc:** Meraj Rahimi  
**Subject:** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

11.00 a.m for you correspond to 5 p.m. for me, that means in a bit more than 2 hours. If it is correct then it is ok for me.

It would be helpful for better understanding by phone call to have a list of points (if possible detailed points) you want to discuss.  
If you can provide me such list before this phone call, it would be great !

what phone number shall I call ?

catherine

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**De :** Michael.Conroy@dot.gov [mailto:Michael.Conroy@dot.gov]  
**Envoyé :** mercredi 22 avril 2009 14:55  
**À :** GRANDHOMME Catherine (TN International)  
**Cc :** Meraj.Rahimi@nrc.gov  
**Objet :** FW: Request for Review of TNBGC-1 Certificate, Rev. Iak

Catherine - What is your preference?

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**From:** Meraj Rahimi [mailto:Meraj.Rahimi@nrc.gov]  
**Sent:** Wednesday, April 22, 2009 8:45 AM  
**To:** Conroy, Michael <PHMSA>  
**Subject:** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

We can do it today either at 11:00 a.m. or 1:00 p.m. If not, we can do it Monday or any other day next week.

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**From:** Michael.Conroy@dot.gov [mailto:Michael.Conroy@dot.gov]  
**Sent:** Wednesday, April 22, 2009 8:22 AM  
**To:** Meraj Rahimi  
**Subject:** FW: Request for Review of TNBGC-1 Certificate, Rev. Iak

Meraj- What is your preference for a call time? (I can't do Friday afternoon).

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**From:** GRANDHOMME Catherine (TN International) [mailto:catherine.grandhomme@areva.com]  
**Sent:** Wednesday, April 22, 2009 4:40 AM  
**To:** Conroy, Michael <PHMSA>  
**Cc:** Boyle, Rick <PHMSA>  
**Subject:** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

Mike,

the criticality study is done with 7 kg of Uranium for content 11.  
Your previous validation limited the weight to 5 kg of Uranium in order to fulfill criterion of 0.95.

It is acceptable for us to limit to 5 kg.

I understand that they may have some difficulties for your review and we are ready if needed to have a conference call with NRC to help for understanding.

We can propose this afternoon 4 or 5 p.m in France (morning for you) but if it is too time short maybe thursday or friday afternoon (in France).

catherine grandhomme

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**De :** Michael.Conroy@dot.gov [mailto:Michael.Conroy@dot.gov]

**Envoyé :** mardi 21 avril 2009 23:50

**À :** GRANDHOMME Catherine (TN International)

**Cc :** rick.boyle@dot.gov

**Objet :** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

Catherine-

I have had additional discussions with NRC staff. They do have some concerns on your criticality calculations. You used a criterion of  $k\text{-effective} + 3\sigma \leq .98$ , but the US NRC limit is .95. Your calculated results shown for content 11 exceed this NRC limit. Also, they have concerns about allowing other hydrogenous material, with densities less than water, in the package.

Also, looking closer at the table you sent, it is of limited use. I am not sure we have the referenced Previous SAR version. I have only portions of it from our last revalidations. The last full SAR that NRC has on file is the 1998 document 990-Z-1-6, Rev. 4. Therefore, it is difficult for us to determine what, if any, other changes there have been to the design, methodologies, assumptions, or approach that might impact our assessment. This makes doing an expedited review difficult.

NRC is willing to participate in a conference call with you and your colleagues if you think that might be helpful in understanding our concerns and in planning a path forward. Let me know if you wish to do that.

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**From:** Conroy, Michael <PHMSA>

**Sent:** Friday, April 17, 2009 4:32 PM

**To:** 'GRANDHOMME Catherine (TN International)'

**Subject:** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

Catherine-

Your table is helpful, but it would still be nice to have a listing of the non-editorial changes in the SAR. For instance, I understand there may be some changes in the tiedowns that are not evident in the certificate revisions.

Regarding your April 9<sup>th</sup> propositions, I have reviewed them, but as they pertain to the criticality calculations, I have asked NRC to give me a quick response to them as well. They have given me some preliminary thoughts and I should have more input from them next week.

I hope we can come to an agreement on them, but I can not commit to that yet. I will let you know more next week.

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**From:** GRANDHOMME Catherine (TN International) [mailto:catherine.grandhomme@areva.com]  
**Sent:** Thursday, April 16, 2009 11:59 AM  
**To:** Conroy, Michael <PHMSA>  
**Subject:** RE: Request for Review of TNBGC-1 Certificate, Rev. Iak

Mike,

please find enclosed the table of correlation between chapters of old SAR and new SAR.  
does it correspond to your need ?

did you have time to look at my propositions in my mail of April, 9th ?

catherine