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71 FR 5088

From:	J. Greg Sanchez <greg.sanchez@nyct.com>
To:	<nrcrep@nrc.gov>
Date:	Mon, Mar 13, 2006 5:02 PM
Subject:	Response from "Comment on NRC Documents"

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Below is the result of your feedback form. It was submitted by

J. Greg Sanchez (greg.sanchez@nyct.com) on Monday, March 13, 2006 at 17:01:49

Document_Title: NUREG-1824 / EPRI 1011999
Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications
Volume 6: Fire Dynamics Simulator (FDS)
January 2006

Comments: I am quite concerned with the broad use of FDS. I am concerned because a lot of people use it primarily because it is a free code.

Here are my major converns with the code and its potential impact on the results, especiallu whrn it comes to power plants.

1. FDS uses the mixture fraction approach, in which the fuel and oxidizer always react eventually, regardless of temperature. This can be see in FDS flammability diagram, Figure 3.2. It says that at any temperature above 1400 deg. C, everything ignites, even if there is no oxygen. We all know that oxygen is the key component for combustion, and if there is no oxygen, there is no fire for that matter. Therefore, this is wrong and must be reconsidred. We deal with diffusion flames, and this assumption just does not cut it. There is a flammability zone between upper and lower limits, and the temperature must be above auto ignition temperature. This assumption is not appropriate for the type of problems it intents to solve.
2. FDS states that if the fire heat release rate were prescribed, the accuray would be between 5 to 20% with experimental measurements. I wish they would warn the users how to model the system so that yo can be within this range. Let's be clear: we do not know the fire heat release rate and if I have an error in my prescription of it, can you imagine the error I would have in teh results. Therefore, when dealing with power plants, this is very critical, and I don't think NRC should take the risk of potential errors, especially when users cannot really check the results. FDS is a black box, and since it is free, people don't feel the need to spend the time examining results.
3. FDS says that if the program were to be used to predict the fire heat releaserate, the uncertainty would be much higher that if the fire heat release were prescribed. But remember, we do not know the fire heat release rate. Am I to understand that I can expect errors, and there is no guidance as to how to check? I think NRC is taking a big risk in endorsing this program as is.
4. FDS uses LES, which requires smaller time steps and small filter grid size. Yes, some would argue that you can do coarse grid modeling and get an answer. I am not denying getting an answer. I am concern with the quality of the answer. Stephen Pope prtescribes that to do LES, you must resolve 80% (or more) of the tubulent kinetic energy and model 20% (or less). This condition MUST BE SATISFIED EVERYWHERE IN THE DOMAIN; Not just in the fire zone. I have conducted some LES simulations and compared them agains RANS. The plotting the resolved/total TKE in LES, I observed the I violated the 80% criterion over 90% of my domain. Therefore I concluded that my LES model required refinement - mesh and time step size. I cannot check this with FDS, but based on my experience, I have seen many users uysing coarse gride size and because FDS gives you an answer, they claim it is right. However, I have comcluded based on my LES modeling that LES is not practical yet for most indu!
strial applications. I think we still need to rely on RANS and account for the physics more realistically so that we can make better decisions.

In summary, I strongle object to accepting this report as is. FDS is not the universal tool. I can only solve for cartesian coordinates, and the physics (fire and fluid dynamics) need refinements.

SISP Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = M. Salley (MXS3)

I have other concerns, but I think I have made the most significant comments, which have great ramifications, especially when we are dealing with power plant analysis.

organization: NYCT

address1: 2 Broadway

address2:

city: New York

state: NY

zip: 10004

country: USA

phone: 646 252 4462

Mail Envelope Properties (4415EBD8.BC0 : 10 : 19392)

Subject:	Response from "Comment on NRC Documents"
Creation Date:	Mon, Mar 13, 2006 5:01 PM
From:	J. Greg Sanchez <greg.sanchez@nyct.com>
Created By:	greg.sanchez@nyct.com

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