Brenner, Eliot

To: Edward Peschko
Cc: CHAIRMAN Resource
Subject: RE: Followup interview to Dr. Jaczko's Stanford talk

Mr. Peschko:

I asked one of my staffers to look at your email and develop some answers. I have appended them below. The basic information is grouped by subject area rather than going line by line through the questions you raised.

Thanks for writing.

Eliot Brenner

Independence: The NRC creates, modifies and enforces its regulations under the authority of the Atomic Energy Act. The agency takes these actions without Congressional approval, but the agency does work with Congress if the NRC perceives the need for additional authority. The NRC already has the authority to set its fees in order to meet the Congressional mandate of recovering 90 percent of its budget, and is considering the policy issues regarding the appropriate fee structure for small, modular reactors.

Costs: The NRC's mission involves ensuring public health and safety without regard to costs. Construction costs are not an NRC issue.

Alternate Fuel Cycles: The NRC has discussed non-LWR designs with reactor vendors for several years, and the agency expects to receive design certification applications for non-LWR designs starting in 2012. The staff continues to examine the regulatory changes that would be necessary to license a reprocessing facility for a closed fuel cycle approach.

"Military" reactors: Except in the case of explicit direction from the White House, reactors for electricity generation would fall under NRC jurisdiction for review and possible licensing. The NRC's Advanced Reactor Program in the Office of New Reactors is currently working with both the Departments of Energy and Defense regarding the issue of small modular reactors possibly being used on U.S. military bases.

"cookie-cutter" COL applications: The basic "nuclear island" and safety systems of a certified design remains the same for any COL that references the design, this is the heart of the standardization approach. Each COL application will have site-specific alterations to the balance of the plant.

Google/Yahoo: The NRC is using enterprise program management software to optimize our review activities, but our reviews are based on the data provided, not the degree to which applications use similar language. The staff does perform an "acceptance check" to ensure an application provides data in every required area before we devote resources to a full review, which must examine the information in detail to ensure our regulations will be met.

Simulation API for certification: If the industry and academia create an verified and validated API along the lines of what's envisioned through the ORNL project, the NRC could consider information from that API in licensing reviews. This is same way the NRC treats information generated by

existing computer codes for core behavior, accident conditions, etc. It would not, however, be the case that a successful simulation would mean automatic certification

SMRs: The NRC is currently expecting applications in the late 2011-2012 timeframe for certifying several small modular reactor designs. There will always be site-specific reviews for any COL application, even for small modular designs. The NRC is currently contemplating how to apply the license fee structure to SMRs. The certification process often includes testing of components and subsystems to provide data necessary to show a design will meet NRC requirements, but any fully operational prototype would require the full licensing process, since it would still be a civilian use of nuclear materials. The agency's licensing process does include a "manufacturing license" for cases where a reactor would be built in one location but sited and operated somewhere else.

Non-electricity uses: Any reactor design or application will have to meet the same basic NRC requirements for safe operation and the ability to shut down safely. Any uses outside of electricity generation that could pose a safety hazard for the reactor (e.g., process heat for a chemical refinery or oil production) would have to show the design would be able to handle the additional hazard.

From: Edward Peschko [mailto:edp@yahoo-inc.com]
Sent: Wednesday, June 09, 2010 9:26 PM
To: Brenner, Eliot
Cc: CHAIRMAN Resource; Edward Peschko
Subject: Re: Followup interview to Dr. Jaczko's Stanford talk

Eliot,

Thanks for doing this.. As for me, I've put together a list of – IMO - very pertinent questions for the NRC for which it would be great to get answers.

And whether or not an interview happens, I'm hoping that you guys address them (or have addressed them already).

Call me a bit radical (or insane), but I'm a 'nuclear' voter: my number one criteria for whether or not I vote for someone is their stance on nuclear power and what they want to do to help its sustainable growth.

I also have the somewhat non-mainstream view that the US – when it turned against next generation nuclear technologies (especially liquid salt reactors), it basically rejected the next internal combustion engine, and we are all suffering as a result today.

Hence, how you guys proceed, and structure yourselves to expedite these technologies by lowering nuclear barriers in the US (whilst maintaining your safety profile) IMO is of paramount importance. Our fate is truly in the balance with this issue - whether or not we as Americans keep our lifestyles and status, or slip into mediocrity and irrelevance in the 21st century.

And I am a strong believer that the NRC can rise to the challenge – that it just takes a hefty dollop of new thinking.

Anyways, again, thanks for the talk, and I'll look for the slides..

Ed

(ps – I should clarify, I'm in no way connected with Mr. Adams, except for reading his blog... Although again, I think he makes a very solid case with his posts..)

Topics to cover, warning in advance (its a bit long):

- **Measure of independence of the NRC**. One of the gratifying things I heard during the presentation was that the NRC has some independence - outside of congress - with regards to regulation matters, and hence would have (for example) the ability to change the fee structure and procedures on how it certifies reactors.

Questions: Is this an accurate assessment of the situation? If so, where does the NRC draw the line on what it can independently do and what it is reliant on congress to legislate?

- Discrepancy between US and chinese/south korean nuclear costs.

I had a chance to briefly talk with Dr Jaczko about this after the talk. It was my understanding that nuclear plants were costing $1500-$2500/KW overnight cost in china/south korea, as opposed to our $6000-10000/KW here. Dr. Jaczko disputed this.

Anyways it seemed to me an odd thing to dispute given:

a) the historical costs of reactor construction in this country (http://www.phyast.pitt.edu/~blc/book/chapter9.html)
b) the original costing of the AP-1000 project in china ($6.3 billion for 4 1GW reactors),
c) the original cost estimates of westinghouse for the AP-1000 (at $1000/KW),
d) the literature costs of various power plants from world-nuclear (http://www.world-nuclear.org/info/inf02.html), and

e) the historical benefits that economies of scale bring to markets, which china certainly embodies.

Nonetheless I still haven't seen a good breakdown of costs between a representative, current US example and say a representative, current South Korean example of a reactor install.

Questions - What work has the NRC done on the breakdown of costs, US vs South Korea/China, and what were the findings?

- Alternate fuel cycles. Everything in the talk focused on the current, pressurized LWR designs, but all the research I've done points to other fuel cycles being quite a bit more efficient and cheap than their LWR counterparts (especially the MSRs and derivatives, especially ones based on thorium and U-233 - eg, http://nextbigfuture.com/2010/04/molten-salt-based-accelerator-driven.html)

Question: what work has the NRC done on preparing for these fuel cycles coming online?

- Military reactors. It seems to me that - for commercialization of alternative fuel cycles - it is *crucial* for the NRC to work with military agencies closely, and take any prototypes and/or other operational data that they make in consideration when civilian knock-offs occur, and to use this data as a 'shortcut' for making civilian use for m.

Question: Given DARPA's lead in pursuing these types of reactors (eg: https://www.fbo.gov/spg/ODA/DARPA/CMO/DARPA-SN-10-37/listing.html) what organizations does the NRC have in place to take whatever technologies the military develops and re-use the military experience to shorten the path to subsequent commercialization? (think ARPANET giving rise to the internet)

- role of standardization and automation. As an automation engineer, I can't help but think that the time in both certifying designs and in streamlining construction could be vastly reduced by the proper application of automation techniques.

Question #1. So, how 'cookie cutter' are the COL applications? Are they 'one off' - ie: each application tailor-fitted to

the situation - or are they standardized across the given designs?

If they are standardized from design to design, there are several statistical techniques (eg: Latent Semantic Analysis or LSA) that could be used to gauge completeness of any given application - google and yahoo (my employer) regularly use this on a day-to-day basis to both judge the quality of data that they curate.

The idea here would be then, to use these same techniques to give applicants an idea of how complete their applications were and what sections need work - automatically - and only involve regulators AFTER the program has judged the submission sufficient for review (or the applicant asks for direct review – never trust a computer completely :)).

Likewise, if engineering firms could work towards a standardized API which simulates their designs (and the response of the designs to various accidents) and if results of these simulations could go towards design certification, then a lot of middlework could be avoided, as there would be no communications mishaps - a large part of the certification process would be simply running and verifying that the simulations were accurate and worked correctly. Think of a giant virtual wind tunnel, and you get the idea.

Question #2: has the NRC contracted with a google, or yahoo, or even IBM/accenture, to see how automation could streamline the licensing process?

Question #3 – Has there been work towards a centralized simulation API for helping with certification? It looks like I'm not the only one with this idea - what work is the NRC doing with ORNL, to support the following in fast-tracking certification: http://djysrv.blogspot.com/2010/05/oak-ridge-supercomputers-to-model.html

- **Small Modular Reactors (or SMRs)**. I was hoping in the presentation to get an update on how the NRC was planning on handling SMRs, which to me stand as the greatest hope we have for nuclear (or any other energy source for that matter.)

Question Group #1: How far away are we from comprehensive reform on how SMRs are licensed? Will the design be certified independently of the working environment (assuming the working environment is relatively stable like being buried and surrounded by x meters of concrete). Will the 'per reactor' licensing fee go away?

Question Group #2: One of the great things about SMRs is that they can be easily made as prototypes, and as pointed out in the presentation, nuclear issues arise in actual use, quite frequently. Hence, will prototypes - with appropriate safety sensors feeding back data to the NRC - be allowed in certification? If not, why not?

Question Group #3: Many of the safety issues with mass production come from the industrial environment in which products are made. Could the 'unit of certification' become the factory, instead of the individual reactor?

- **Uses for reactors aside from electricity.** Again, there are several uses for nuclear power that the US hasn't touched for domestic use - such as use in tar sands, large scale desalinization, creation of fuel oil from biomass or coal, making cement and/or steel, direct replacement of coal, etc. Complicating this fact is that most of these uses - due to high temperature operating conditions - require new fuel cycles, and that there is a great deal of urgency for them due to possible environmental catastrophe (I hate to think what would happen if the ogallala aquifer failed)

Question: How does the NRC intend on both certifying plants for nuclear power uses outside the electricity sector and regulating their ultimate use?