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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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REGULATORY POLICIES AND PRACTICES SUBCOMMITTEE

+ + + + +

TUESDAY

NOVEMBER 16, 2021

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The Subcommittee met via Video Teleconference, at 2:00 p.m. EST, Ron Ballinger, Chairman, presiding.

COMMITTEE MEMBERS:

MATTHEW W. SUNSERI, Member

RONALD G. BALLINGER, Member

VICKI BIER, Member

CHARLES H. BROWN, JR. Member

VESNA B. DIMITRIJEVIC, Member

GREG HALNON, Member

JOSE MARCH-LEUBA, Member

DAVID PETTI, Member

JOY L. REMPE, Member

ACRS CONSULTANT:

STEVE SCHULTZ

DESIGNATED FEDERAL OFFICIAL:

HOWARD KENT

ALSO PRESENT:

STANLEY GARDOCKI, RES

STEVEN JONES, NRR

SCOTT MOORE, Executive Director, ACRS

P R O C E E D I N G S

2:00 p.m.

CHAIR SUNSERI: Good afternoon everyone. It is 2 p.m. Eastern Time. The meeting will now come to order.

My name is Matthew Sunseri, and I am the subcommittee chair for the Regulatory Policies and Practices Subcommittee meeting for today.

I'll just call down the roll here from what I see, and then check that we have a quorum.

But anyway, I see Ron Ballinger, Vicki Bier, Dennis Bley, Vesna Dimitrijevic, Greg Halnon, Jose March-Leuba, Dave Petti, Joy Rempe, myself, and our consultant is with us today also, Steve Schultz.

Did I miss any members?

(No audible response.)

CHAIR SUNSERI: Okay. The purpose of this is a information briefing today, is for the NRC staff to brief the subcommittee on Draft Guide 1381, which will be Reg Guide 1.244, titled Control of Heavy Loads at Nuclear Facilities.

Mr. Kent Howard, of the ACRS staff is our designated fellow officer for this meeting.

During today's meeting, the subcommittee will gather information and analyze relevant issues

and facts, and familiar proposed positions and actions as appropriate.

However, at this subcommittee's discretion, any matter will be considered for presentation at the full committee, if necessary and if members see fit.

However, I will note that as I mentioned, this is an information briefing, and I'm not really anticipating writing a letter at this time based on the review that I've done, and the information that we've seen from the staff already. But anyway, we'll see what the committee feels at the end.

The ACRS was established by statute as governed by the Federal Advisory Committee Act. The committee only speaks through its published letter reports.

Because this is a subcommittee meeting, persons should consider any remarks by ACRS members as their personal comments, and not committee positions.

We hold subcommittee meetings to gather information and perform preparatory work that will report our deliberations at full committee meetings, if necessary.

The rules for participation in all ACRS meetings including today's, were announced previously

in the Federal Register notice and included on our website.

The ACRS section of the U.S. NRC public website provides our charter, bylaws, agendas, letter reports, and transcripts of all full and subcommittee meetings, including presented material.

As stated on the website, members of the public who desire to provide a written or oral input to the subcommittee may do so, and should contact the designated federal officer five days prior to the meeting, as practical.

Today's meeting is open to the public attendance, and there will be time set aside during the meeting for comments from members of the public attending, or listening.

Due to the Covid pandemic, today's meeting is being held over Microsoft Teams for ACRS and NRC attendees. There is also a call-in number allowing participants of the public to connect to the Teams session.

A transcript of the meeting is being kept. Therefore, we request that meeting participants not on the agenda identify themselves when they are asked to speak, and speak with sufficient clarity and volume so they can readily be heard.

At this time, I ask attendees to put their devices on mute to minimize disruptions, and only unmute when speaking.

So, before we get into the meat of today, I'll just call on the members. Members, any questions about the agenda for today, or any comments you want to make before we get started?

(No audible response.)

CHAIR SUNSERI: All right, we will now proceed with the meeting, and I call on Mr. Steve Jones, Acting Branch Chief of Containment and Plant Systems Branch, the Division of Reactor Regulation, to make any introductory remarks.

Mr. Jones, go ahead. You have the floor.

MR. JONES: Thank you, Chairman.

Good afternoon, my name is Steven Jones, I'm currently serving as Acting Chief of the Containment Plant Systems Branch in the Division of Safety Systems, Office of Nuclear Reactor Regulation.

I'm here to brief the subcommittee on the Draft Final Regulatory Guide 1.244, addressing control of heavy loads at nuclear facilities.

This guide was previously issued as DG-1381 for public comment from, approximately from May through July.

The Reg Guide is intended to provide guidance for the design, operation, maintenance, inspection, and testing of material handling equipment used at nuclear facilities under circumstances where handling errors could threaten the satisfactory accomplishment of essential safety functions.

The agenda for this meeting includes discussion of the change in the guidance as a result of the Reg Guide, a brief discussion of safety significance, a resolution of public comments received, and a brief discussion of our, of the staff's conclusions.

I'm happy to address questions at any point in the presentation. And in addition, there are several staff members available to address areas linked to control of heavy loads, that may be outside the scope of the, of this Reg Guide.

So, the intent of the issuance of Reg Guide 1.244 was to adopt national consensus standards where appropriate, to update guidance, and to expand the scope to cover licensing under Parts 50, 52 and 72 of Title 10 of the Code of Federal Regulations.

Part 50 is the traditional licensing approach for operating nuclear reactors, and certain utilization facilities.

Part 52 for the newer design reactors and alternative licensing approach, and Part 72 covers the licensing of independent spent fuel storage installations.

These parts all include similar requirements to provide appropriate protection from the effects of equipment failures, and natural phenomena, and thereby provide reasonable assurance that essential safety functions would be accomplished.

These parts also include requirements to describe normal operations, including maintenance and testing of equipment important to safety.

First, I'll touch on the existing guidelines.

Control of heavy load movement has been part of the nuclear reactor licensing bases since the 1970s. And, through a generic letter issued in 1980, the staff requested all licensees and applicants to address conformance with the guidance in NUREG-0612.

NUREG-0612 invoked several secondary standards governing design, operation, and maintenance of heavy load handling equipment.

But only NUREG-0554, which was single failure proof cranes for nuclear power plants, and ANSI N14.6, which covered, or which addressed the

design of special lifting devices for shipping containers, applied to the design of important to safety structure systems and components.

NUREG-0612 specifically provided guidelines for safe handling of loads in areas where the effects of a handling accident could threaten the accomplishment of essential safety functions.

Particularly, this included areas around the reactor vessel and spent fuel pool, where direct damage to fuel, or damage that causes a loss of cooling water from either the reactor vessel or spent fuel pool, could result in a release of radioactive material.

The NUREG-0612 guidelines also included good industrial load handling practices as a defense and def measure. Those included provisions from typical industrial standards, such as ASME B30.2, which covers the design and operation of overhead crane -- and I'm sorry, and ASME B30.9 for slings. For use of slings with heavy load handling equipment.

The NUREG-0554 guidelines provided somewhat detailed guidance for the design of single failure proof for what I'll term in this meeting, enhanced reliability handling systems, for overhead cranes that provide means to compensate for equipment

failures, and withstand the effects of seismic events while still being able to stop and hold the load.

The ANSI N14.6 standard provides design testing and provisions for periodic demonstration of continued compliance with those design measures for permanent, special lifting devices that generally provide a rigid connection between frequently handled loads, and the crane load block.

Reg Guide 1.244 is proposed to endorse the three ASME standards at ASME NML-1, Rules for the Movement of Loads Using Overhead Handling Equipment in Nuclear Facilities, provides the overall general guidance for a heavy load handling program.

An appendix to NML-1 provides a comparison of the guidelines in that standard with NUREG-0612.

It also uses a risk informed approach considering qualitative risk insights related to the type of lift, and the surroundings.

Its scope is somewhat broader than NUREG-0612. It covers for instance, operations in the yard of nuclear power plants, or operations related to interim, I'm sorry, to independent spent fuel storage installations.

And, it has also been updated to reflect operating experience insights that have been

accumulated since, since the 1980s related to control of heavy loads, especially with respect to below the hook activities, such as problems with the sling usage and basket, or choker configurations, and which is described in ASME B30.9.

And, it also relaxes requirements related to special lifting devices, which have demonstrated very good performance over the last 40 years as part of an overall handling system for repeated handling of very large loads, such as reactor vessel heads, vessel internals, or independent spent fuel storage installation transfer casks, and loaded fuel canisters.

MEMBER BROWN: Can I ask a question?

MR. JONES: Sure.

MEMBER BROWN: This is Charlie Brown.

MR. JONES: Uh huh.

MEMBER BROWN: I guess I'd like to have you explain a little bit, what do we mean by a qualitative risk inform approach for lifting stuff?

I thought cranes, their cables, the slings, all had load requirements and testing requirements you know, to at least make sure their strength and characteristics exceeded those needed for any particular load.

How do you make that qualitative?

MR. JONES: You're correct, that the standard provides for specific requirements for the handling system, the crane, and also any slings or special lifting devices associated with that. And, as well as the load lifting attachments.

However, the standard provides for, excuse me, a graded assessment of the risk associated with the, excuse me, with the load movement. Specifically, there are the first element of any lift approach is to classify the lift per NML-1.

And, that involves assessing the antenna'd rigging applications, as well as what's surrounding the lift path, and identifying any, any important to safety structures or components.

This Reg Guide is intended to apply predominantly to what's classified as nuclear safety critical lifts. And, that's where the damage from a postulated handling system failure could result in the loss of a safety function.

In other words, for example, direct mechanical damage to the fuel, which would, could cause a release of gasseous fission products within the fuel. Or, as I mentioned earlier, loss of water from the spent fuel pool, or the reactor vessel.

A change in configuration of the fuel that could affect criticality. Or, away from the vessel or the spent fuel pool, damage to redundant trains of safety related equipment that perform the same function.

For example, if cooling water, service water, provides essential cooling via two pipelines that are independent but they happen to be close enough together that a single load drop can, could damage or interrupt flow in both, then that would be one of the areas subject to classification as that nuclear safety critical lift.

Other circumstances would be considered less risky and may be subject, for example, under the maintenance rule or seismic two-over-one criteria, that are also somewhat discussed in NML-1, but really kind of outside the scope of the NRC's regulation of heavy loads as a consideration in the safety analysis specifically. That's more risk management and maintenance associated.

Does that address your question?

MEMBER BROWN: Well, the initial, the items you listed initially sounded like pretty specific requirements. There was nothing evaluative about it. They either had to be clear, you know, you put a

checkmark by it or you don't.

MR. JONES: Well, I mean, I guess I wasn't complete. There's several, I mean you can use lesser quality cranes, or even a mobile crane, depending on your assessment of the risk, and what you're around, what is involved.

For example, a removal of an out-of-service component where, and in the yard, where you know, even if the mobile crane toppled and were to strike other things, there would be no challenge to any safety function. Then that would have essentially the lowest grade of control under NML-1 provisions. That's considered a normal lift.

Then there's a classification as a special lift where the, this would be more likely to involve movement of one train, effecting one train of a safety system, where the maintenance rule requirements may be coming into play.

And, a third category is critical lift. And, this could involve, I mean the standard is actually intended to encompass things beyond nuclear power plants, including aerospace activities where very high value components might be handled by the crane, and might be deemed critical lifts.

But a subset of that is nuclear safety

critical lifts, which meet the criteria described earlier.

So, and that's the sense that there's a qualitative risk informed approach within the standard

And, so the types of handling systems, the qualification of the rigging components, and the degree of extra measures provided to protect those components from the effects of any load drop, all vary based on that load classification.

MEMBER BIER: If I can chime in for a minute, this is Vicki Bier.

I want to see if I'm understanding correctly, and if so, maybe it will help answer Charlie's question as well.

Charlie's comment was that the slings and cranes, and whatever else, have very concrete numerical criteria for strength, et cetera.

MR. JONES: Right.

MEMBER BIER: And, as I read it, the qualitative risk informed approach applies to what's under the cranes, not to the cranes.

And, my read of the word qualitative is kind of you don't need to do a PRA to decide how important this stuff is that's under the crane.

Is that a fair kind of shorthand summary?

MR. JONES: Yes, but I'd like to qualify that with there are differences in actually the types of cranes that can be used under various circumstances. And, also the degree of qualification.

Even if you use an overhead crane that, you know, is similar to what might be considered you know, single failure proof or enhanced reliability, or enhanced safety crane.

NOG-1 actually has three types of cranes. A type-3 is a standard industrial overhead crane. Type-2 is seismically qualified to remain in place, but not, not under load. So, addresses seismic two-over-one concerns, for example.

And, then the type-1 crane is, has redundant features, such that if certain components were to fail, or not operate as designed, the crane would still be able to hold the load and prevent it from dropping. Or cause damage to either the load itself, or external components.

So, is that a little more clear?

And, then under the hook, you're correct. There's differences.

ASME B30.9 has you know, a single standard for a certain lift. But if you're employing it with a nuclear safety critical load, then the guidelines

call for either having redundant load paths of equivalent capability, or a single load path with twice the design factors that would be applied to a normal handling evolution.

MEMBER BROWN: What --

(Simultaneous speaking.)

MR. JONES: Can the --

MEMBER BROWN: Go ahead, I'm sorry.

MR. JONES: The same applies to special lifting devices as well.

MEMBER BROWN: They still sound pretty specific, quantifiables. I understand you used it for a different type of crane, but you said of one of lesser qualification. That one I don't quite understand how --

MR. JONES: Well --

MEMBER BROWN: -- a lesser qualification, what that means.

You don't have to have a double carriage on the slings? Or you don't have to have the same testing to ensure that that load capacity is really what it is because it hasn't changed since the last, or been damaged in some period of time since it was last used?

I'm just still struggling. It sounds to

me like it's pretty specific even now. That's where I'm --

CHAIR SUNSERI: Charlie, this is Matt. Maybe this helps. I'll try to simplify it quite a bit.

MEMBER BROWN: No, I'm sorry to beat this to death. I just wanted to have an understanding of this area, that's all.

CHAIR SUNSERI: It's maybe to the point of oversimplifying it here.

So, you know, the extreme, on one extreme end is a highly nuclear safety consequential lift. If it goes wrong, bad day, right? That's the highest end of the spectrum.

And, so what he's saying is that he's got this qualitative guidelines to assess when to apply those standards, to have all the you know, nuclear grade load dropping capability, no tipping, all that stuff.

On the other end of the spectrum is what I'll call a commercial lift. You could be lifting a container in Walmart's parking lot and use that kind of crane for that.

So, you know, the qualitative assessment is there to help decide which crane is appropriate

based on the nuclear safety risks.

Did I say that simplified enough, Steve? Is that close?

MR. JONES: Yes, that's very close.

I mean this standard's not meant to be, I mean it is meant to cover a very large spectrum. And, at the bottom end, you're basically just complying with OSHA requirements for what would be done at any industrial site using a crane to lift things, components around people.

MEMBER BROWN: Okay.

MR. JONES: Does that help, Charlie?

MEMBER BROWN: Yes, I mean yes.

I understand the desire not to hammer everything with the nuclear set of standards. Obviously, that makes sense no matter what. I just was trying to get a handle on what, what changes when you do that, okay?

And, you've kind of captured the bottom, the bottom feeder in when you're in the parking lot of Walmart and want to lift up a shipping container.

MR. JONES: Right.

MEMBER BROWN: That certainly clarifies it.

Okay, thanks. I won't beat this one to death anymore.

CHAIR SUNSERI: No, that's a good question.

Go ahead, Steve. Continue on.

MR. JONES: All right, I'll move on to the next two standards.

ASME NOG-1, the Reg Guide is endorsing the 2020 version of this standard. By the way, going back, ASME NML-1 was new for 2019, so that's the reason that this Reg Guide is essentially being produced. Or being considered for issuance at this time, because that's what allowed us to replace the old technical guidance in NUREG-0612.

And, then so this standard addresses specifically, a specific type of overhead crane that uses a wire rope hoist and redundant girders that carry a trolley, you know, over a fixed span usually within a building, without the walls of the building structure supporting the crane.

But it could also be a gantry, or semi-gantry crane where the crane itself runs on tracks at ground level on one or both sides.

The main factor here is to address the new technologies that have been incorporated into these types of overhead cranes, especially related to the drive systems and the brakes, or the means of slowing the load during lowering evolutions.

There used to be a commonly, a mechanical load brake, and they would just use a DC-type of motor for the hoist.

Now, there's a variable frequency, AC motor drives, that can literally do what they call float the load, where it adjusts the field strength of the motor to just hold the load in position without engaging any brakes.

And, it also can use electrical components to basically dissipate the heat of lowering the energy from lowering the load, through a resister bank, and use that as a controlled braking means during lowering, which were not really addressed in NUREG-0554.

In addition, it provides a great deal more detail with regard to the design of the single failure proof, or enhanced safety cranes.

All the recent cranes, or I'm sorry, design certifications involving for example AP1000, have cited this standard, an earlier version of this standard, for those cranes.

And, then the final standard is ASME BTH-1 2017. It's designed for both as it says here, design of below the hook lifting devices.

And, specifically, we're looking at

chapters 1 through 3, which address static mechanical devices that directly support the load.

There are some provisions in that standard for example, with magnetic hoists, or magnetic devices and other features that might be used in other lifting applications.

So, our intent here is to only accept mechanical lifting devices that directly connect to the loads.

The provisions of ANSE N14.6 that direct with continued compliance, are covered in NML-1 as far as you know, periodically verifying that the special lifting device, which is really just typically a steel structure, that the welds are not developing cracks, that the dimensions of the lifting device are not changing.

That's encompassed in NML-1 now, instead of in use of ANSI N14.6, which was no longer, which has been withdrawn and was really no longer getting support for upgrades.

The effect of this new guidelines is to really recognize that as I mentioned before, the changes in technology and the lessons learned from decades of operating experience under the previous guidelines.

One of the big factors, or big changes, is to administratively restrict sling usage to either straight connections between specially designed attachment points, or use of basket configurations only around large diameter round objects, for nuclear safety critical lifts, that highest, or most concerning category of lifts.

That's really based on operating experience that was, did not involve nuclear safety critical lifts, but where objects were supported by slings wrapped around the object.

And, a corner of that component was able to cut through the sling material when the corner protection devices that were placed by riggers, moved out of position.

So, that really isn't meeting the intent of an enhanced safety lift. So, we're trying to start from the basic design where that protection against cutting is inherent in the rigging design.

And, then beyond that, having additional safety factors either provided through a redundant rigging, or enhanced safety factors in the single rigging path.

We've also recognized like, as I mentioned before, the very good performance of special lifting

devices, and reduced the design margins incorporated in those, and the periodic testing of special lifting devices.

This reflects mostly a transition to a different means of verifying the integrity of the structure.

And as I mentioned, the design standard with ASME BTH-1 is intended really for again, everything from lifting a component in the Walmart parking lot, to use that example, to a nuclear safety critical lift where there might be significant other safety concerns.

And, what changes is the design factors, and the quality applied to the design and initial testing of those devices.

But it moves away from the ANSI N14.6 guidelines where you could be designing things with a factor of safety of 10 on an ultimate, or a 6 on the yield, which really probably wasn't providing a lot of extra safety necessarily. It's more just ensuring it's well constructed and that the.

And, also recognizing the intent of ANSI N14.6 was for applications to shipping containers, which would be moved from side-to-side, and used on an almost daily basis where, and be stored externally

when most of the, the special lifting devices that are subject to this Reg Guide would be stationary at a single site, and stored in inside structures.

Either inside an auxiliary building, or reactor building containment structure for periodic use during refueling, or interim, or independent spent fuel storage installation operations.

It also provides for standardization of programs and training. In the fleet now, many lifts are conducted by contracted personnel during refueling outages. So, it helps to have a very standard training and qualification program. This standard helps provide that.

It also adds to the scope of required training in that it covers the rating personnel in the training program, as well as the crane operator, to help reduce the risk of below the hook errors.

In addition, I've added a section that kind of goes beyond the new, beyond these three standards to address guidance for special conditions where really clear, stand alone consensus standards do not exist.

And, this involves areas like large component replacements, such as steam generator replacement activities. Areas where space or

structural limitations preclude use of a standard overhead crane with a wire rope hoist, and redundant girders, such as an aug-1 crane.

And, a lot of activities involving independent spent fuel storage installations that occur outside nuclear power plant structures, but still pose a risk as to the fuel stored inside the canisters.

In other words, for certain applications where the potential drop height exceeds that analyzed for the whatever the canister and overpack design is, for that particular storage cask system.

This however, does not apply to Part 71, you know, transportation casks, which are evaluated separately for impact, and transportation accidents.

Okay, I did want to address the safety significance. Because of generally good standard regulation and design of overhead handling systems, these provide fairly reliable performance.

What we've seen in the nuclear industry is less than what I call one uncontrolled motion, or you know, major drop of a load per 10,000 lifts.

So, in other words, it's something on the order of one even -5 per year, or I'm sorry per lift, chance of a major load drop based on the operating

experience.

And, this comes from generic issue 186 related to again, control of heavy loads and the supporting NUREG-1774, which was discussed with the ACRS committee back in several years ago, 2011, I believe.

Let's see. So, these, the standard heavy load handling equipment is suitable when a safety function would not be challenged by handling system failure. And there are plenty of those operations in the nuclear power plant facility, and we're not intending to regulate that.

But, that is included within the scope of NML-1. And, it provides general controls for standard and special lifts that would fall under that category.

And, I should note again, may be covered by the maintenance rule, or you know, as a risk management action for certain conditions.

Or, there may be a seismic two-over-one concern with certain cranes that are only used during shut down periods that need to be parked in a location where a seismic event would not cause them to impact other safety related equipment.

The enhanced safety handling systems, which is really our focus, reduced the frequency of

uncontrolled motion or load drops by well, the staff expects another one to two orders of magnitude.

The two orders of magnitude would be associated with those lifts using special lifting devices, which provide the greatest assurance of you know, control of the heavy load.

And, the enhanced safety handling systems covered by NOG-1 and BTH-1 then, would be suitable for nuclear safety critical lifts when using cranes designed to that NOG-1, type-1 criteria, and have appropriate lifting devices per NML-1 underneath the hook.

Next thing I wanted to touch on was the public comments received. As I mentioned in the introduction, the availability of Draft Guide 1381, was published in the Federal Register on May 4, 2021. And, the comment period was extended to end of July 5, 2021.

The Nuclear Energy Institute provided 24 comments. Eleven were related to clarification of individual items. I'll touch on those in the next slide.

Five related to the licensing basis change control processes that might be applied with this, and I guess really to look at how to simplify

incorporation of these new endorsed standards in their, in the licensing basis under 10 CFR 50.59, or 10 CFR 72.48.

Four related to endorsement of additional standards. These are generally secondary standards that are already mentioned in NML-1.

And, the staff you know, deliberately selected the three standards that are called out for endorsement because they're related to the design, fabrication, and initial testing, and qualification of permanent structures, or control of the overall handling system program.

And, therefore, the other standards are considered secondary references that are really just invoked by NML-1.

And, in some cases modified by what's stated in NML-1 as far as their applicability to a particular classification of load handling.

And, then four additional comments were related to enhancing the flexibility of operations through credit for administrative controls, or alternative design elements such as for example, doubling the safety factor of some portion of, or some component in the crane.

And, the staff generally did not accept

those, or agree with those comments.

Two individuals provided additional comments that overlapped with NEI comments. These were both related really to below the hook items, and particularly the restrictions on the usage of slings with nuclear safety critical lifts.

Okay, the staff did make some changes to the Draft Guide as a result of these comments. The staff clarified the relationship between ANSI N14.6 and ASME BTH-1, to identify the you know, that they both cover the design and fabrication of special lifting devices.

But BTH-1 does not provide for that demonstration of continuing compliance. That really comes from NML-1, and the secondary standards that it invokes.

The staff also clarified that specifically controlled ranges of motion, which is where the crane is limited by interlocks, or just its physical design, or temporary mechanical stops to limit the range of motion of the carried load, such that it would not interfere with essential safety functions if the load were to drop.

And, those guidelines covering enhanced safety handling systems, which would involve a NOG-1

crane, or some other crane, where the staff specifically accepted its design as providing for enhanced safety might be used with, or I'm sorry, I need to step back.

The enhanced safety handling systems that invoke a NOG-1, type-1 crane, and that also use either the special lifting device, device per BTH-1, and NML-1 considering the, you know, the nuclear safety critical lift classification.

Those two approaches would be considered complete, or may be classified as complete, acceptable methods of evaluation as it relates to 50.59, or 72.48, the licensing basis change control processes.

The staff also explained the basis for the sling restrictions during critical lifts to address multiple comments there.

The staff slightly modified the regulatory guidance related to assignment and qualification of cranes used for nuclear safety critical lifts with controlled ranges of motion.

In that case, you know, we're using a crane with a more standard design, but it's and again, restricted in its range of operation to preclude it from operating in a way that can threaten loads under the, or under or near the crane.

So, those cranes should be seismically qualified, in other words, to prevent toppling during any motion where they're credited in protecting you know, the range of motion is credited in protecting equipment important to safety, or providing for an essential safety function.

Provided the limited clarification for the alternative designs of cranes. In other words, these cranes that do not, or could not be designed using ASME NOG-1, type-1 crane design standard because of either physical constraints of where it's located, or that it's used for a temporary large component replacement, or used outside of buildings for in support of an independent spent fuel storage installation.

So, there's alternate design criteria where hydraulic gantry cranes, or other crane designs that don't have an enhanced safety standard developed.

The intent there is to provide guidance for applications to come in for license, or for review of that as a safety analysis report change addressing specific handling conditions and cranes, where enhanced safety is credited as the means of protecting essential safety functions.

And, then again, clarification of the

sling restrictions for nuclear safety critical lifts.

So, in conclusion, the staff is endorsing three industry standards related to either the overall handling system program, or specific design of nuclear overhead cranes, a specific type of overhead crane, and the special lifting devices that may be used with those cranes.

The staff expects the revised guidance to provide safety and efficiency benefits over the existing guidance provided in technical, NRC staff technical reports developed in the late '70s and early '80s.

And, the staff does expect substantial adoption of NML-1, Control of Heavy Loads programmatic guidance through provisions of the licensing basis change control regulations 50.59 and 72.48.

With that, I'm open to address any questions the members may have.

CHAIR SUNSERI: Thank you, Steve. I appreciate the presentation.

So members, any questions for staff?

MEMBER HALNON: Yes, Steve, this is Greg Halnon.

The little technical questions but you know, 0612 is kind of weaved pretty extensively in our

licensing basis throughout the plants, and procedures, inspection procedures and everything else that we use as the NRC inspectors as well.

I know that 0612 is like 40 years old but why not just update 0612? I mean, is this is it an expensive change? I mean, when you put the two next to each other, is there going to be a huge change in licensing basis and back fit discussions, and those types of things?

MR. JONES: No. There is an appendix in NML-1 addressing compliance, or conformance with the NUREG-0612 guidelines.

And, for the nuclear safety critical list, which is really where this applies, they're essentially identical.

I guess there's certain things are still going to require license amendments because we can't really address, for example, a load drop analysis where that's credited under certain conditions where you know, you're not crediting the crane or the lifting devices just to prevent a load handling drop. And, it is in an area where it could affect an essential safety function.

So, when you're looking at what's the result if you postulate a load dropping, that requires

really a license amendment.

And, these special or non-standard crane designs where when a NOG-1, type-1 crane can't be used, that's another example where we still expect to see license amendments. And, that really doesn't change because NUREG-0612 is not used.

However, I did want to clarify. Because of the commission's back fed and forward fed policies, the you know, NUREG-0612 and NUREG-0554 can still be used, and could still be cited for example, in new applications, if desired.

But our intent is to you know, address the operating experience change, the technology changes that have occurred over the years.

And, also, we're also trying to meet the Commission and I guess the, really the government's policy to endorse national consensus standards wherever appropriate.

MEMBER HALNON: Okay, so it's a voluntary thing --

(Simultaneous speaking.)

MR. JONES: Yes.

MEMBER HALNON: -- that takes that out of the way.

What about I assume that there's NRC staff

on these committees that develop these, and will be on them to cover any potential changes down the road?

MR. JONES: Yes.

MEMBER HALNON: Okay. Last question is for decommissioned plants.

Do these have applicability there as well when they're moving the hive of the waste and whatnot?

MR. JONES: Yes. We have approved license amendments where certain plants needed to be reconfigured, or used specialized, you know, lifting arrangements to support defueling of spent fuel pools.

Especially some of the very you know, the older plants where they weren't designed for 100 ton interim storage, or I'm sorry, I keep using interim, but independent spent fuel storage installation storage cask systems.

Or multi-purpose systems. Sorry.

MEMBER HALNON: So, we should see even the plants that are shut down, adopt at least the applicable portions of these newer standards that are coming out?

MR. JONES: Well, and they may. I'm not certain on you know, that. There may be such a limited period where they expect to still be handling fuel.

Once the fuel is out of, or is removed to

dry storage, they may not have any need to maintain this, the particular part of the heavy loads handling program that deals with nuclear safety critical lifts.

MEMBER HALNON: Okay, yes, I got you.

MR. JONES: They might not (inaudible) valuable.

MEMBER HALNON: Yes, all right, thanks.

CHAIR SUNSERI: Vicki, go ahead with your question.

MEMBER BIER: Sorry, I guess I'm on mute. Okay.

I just wanted to know how this policy would play out in the day-to-day life of say, a resident inspector or somebody.

Are they going to notice compliance or problems kind of only at the moment when there is a lift like this, which may be very infrequent, or is there some other method by which they would be reviewing the policies and procedures on site?

You know, how would we know if there is a problem before something gets dropped?

MR. JONES: The primary areas where this is inspected involve the, the refueling inspection module for operating reactors, and the independent spent fuel storage installation start up inspections, or dry run

inspections, where the staff would be specifically looking at handling system design and operation, and their procedures covering inspection and testing of the components during operation. And, also the procedures on how they handle that.

So, with respect to inspection, that's where Part 72 would invoke it. For Part 50, this routinely applies to the reactor vessel head movements, the reactor vessel internal lifts, and I guess some other lifts may be invoked.

For example, I guess I'm thinking Watts Bar Unit 2 is replacing steam generators in the near future. And, so that process, they're invoking really a load drop analysis type of process.

But that's one example where I'm certain the resident inspectors would be following that activity because they have, that's one example where the load crosses.

Although the reactor is defueled, there's no safety functions within containment itself where the, the steam generators would be moved.

The load path does go over areas where for example, there's two service water lines supporting the operating unit. And, both trains of service water supporting the operating unit. So, that would be

Watts Bar Unit 1.

So, that those are examples I guess, where this would come up in inspection space.

I think this does a better job of maybe highlighting for example, the ANO scatter drop event in 2013 involved a temporary large component replacement activity.

And, this Reg Guide kind of highlights that that needs to be assessed very carefully to determine whether or not there's a you know, a nuclear safety lift, nuclear critical safety lift involved with that type of replacement activity.

And, what types of reviews might be involved with getting approval for that, if necessary. Or maybe conducting the 50, the evaluation whether it's under the maintenance rule or 50.59 to address that situation.

CHAIR SUNSERI: Thank you.

Vesna has a question. Vesna, you have the floor.

MEMBER DIMITRIJEVIC: Thank you. I don't maybe have a question. I just want to make some observation because the AP1000 and you know, advance reactors were mentioned, but what we saw in the new scale review is actually that the risk, the

(inaudible) risk is actually dominated by load drop.

So, we have a very specific situation when you move the module not only if you drop it, you will damage one (inaudible) but it can (inaudible) to core damage.

Also, is not really happening in the shut down, is happening in shut down for the module which is moving for the (inaudible), but is moving in vicinity of operating module, so the load drop can actually damage operating modules.

So, in the looking in this is one of the you know, the multi-module designs. An advance reactor, maybe we will need same type-1 plus category for those load drops in the situation like that.

So, I just want to make that comment.

CHAIR SUNSERI: Thank you. Any response from staff on that or?

MR. JONES: Yes. Are staff available to address specifically I think the new scale design?

If anyone wishes to come forward. Otherwise, I guess what I'd say is that's really what I intended to address with the safety significance.

We expect that you know, the frequency of a load handling problem, especially with a crane designed with you know, to be a NOG-1, type-1 crane,

with a special lifting device conforming with NML-1 being used in that process, would have a you know, a probability of failure in the vicinity of 10 to -7 or lower.

MEMBER DIMITRIJEVIC: Well, you know, but the risk of these advanced reactors is often in the like, never mind, like 10 to -8 , 10 to -9 categories.

MR. JONES: Right.

MEMBER DIMITRIJEVIC: So, even 10 to -7 is a very high contributor.

But as I remember from the review on the new scale, the risk for their load drop was dominated by operator errors of commissions when they do something not proceduralized, or with instrumentation errors.

So, I'm not sure this, the frequency of load drops what they're based on, but this is what was the situation there, so.

CHAIR SUNSERI: So, when we look at things like that, we need to consider other than just the cranes themselves, all the other infrastructure around it.

Good observation, Vesna.

Any other members?

(No audible response.)

CHAIR SUNSERI: Okay, well thank you for the presentation.

I guess I'll now open the floor to anybody listening in to the conversation today, if you would care to make a comment, or provide a remark, this is for the general public.

Any members of the general public wishing to make a statement, you can unmute yourself using *6, make your statement, state your name and make your statements and I'll open the floor.

(No audible response.)

CHAIR SUNSERI: Okay, so we'll close that up and I'll give the same courtesy to any of the staff members, or other participants listening in through the Teams channel, if you'd like to make any comments or statements.

(No audible response.)

CHAIR SUNSERI: All right, appearing none, or me wrapping this up here then shortly.

Let me just say I appreciate the staff coming over here. When I initially reviewed these documents way back a long time ago I felt like it was, you know, the staff was heading in the right direction consolidating, taking industry experience and applying it to the systems.

Anyway, we asked them to come, and then based on our pretty much extensive conversations during new scale, I knew there was a sensitivity to heavy loads, and I know that a lot of this is not directly applicable, but that may be applicable in some applications.

So, I thought it would be useful for the committee members that were interested to hear where the heavy loads program was going, what options would be available, so that as Vesna points out, in the future when we review other advance reactor designs, we'll have a general familiarity with this new standard, if you will, in how it built on the old link.

So, at this point, I really as I said, invited them in here as an information briefing. They have not requested a letter from us, and I don't think we need to have a letter, that's my opinion. But I'll just open it up to the members.

Does anybody feel otherwise, that we should have a letter?

MEMBER HALNON: Matt, this is Greg. Do we have access to these standards? I didn't get a chance to go through all of our documents, but are these standards available to us for our future review on

the, heavy loads in the nuclear reactors?

CHAIR SUNSERI: Yes, yes, we can get the stuff.

MEMBER HALNON: Can put these in our ACRS shared folders?

CHAIR SUNSERI: Working through our --

MEMBER HALNON: Okay.

CHAIR SUNSERI: -- our staff members can obtain them for us.

MEMBER BLEY: Hey, Greg?

MEMBER HALNON: Yes?

MEMBER BLEY: This isn't related to today's talk, but we can have somebody on the staff show you how, but we can get to almost any standards and many journals, too, if you need them.

MEMBER HALNON: I signed up for that online, Dennis. I was able to get some stuff on there.

But it's always, for me it's always a crap shoot if I'm spelling NML right. Nevertheless, I understand.

But back to your original question, Matt. I'm not, unless the staff feels they need some confirmation from the committee, I don't think a letter would be necessary.

MR. GARDOCKI: This is Stan Gardocki, can you hear me?

CHAIR SUNSERI: Yes.

MR. GARDOCKI: Stan Gardocki, I work in Reg Guide branch, and we interface face you were asked on the Reg Guides before were published.

We just need a confirmation from the ACRS that there is no comments in regards to this Reg Guide before we publish it here in the next couple of weeks.

If you can put it in the meeting summary notes or something like that, then we can have confirmation that there's no, ACRS did not have any comments on the Reg Guides.

CHAIR SUNSERI: Can that confirmation come the first week of December, or you need it earlier than that?

MR. GARDOCKI: No, that's fine.

CHAIR SUNSERI: Okay. So, we normally do that in our Planning & Procedures discussion in full committee meetings, and will do that this time.

MR. GARDOCKI: Great. Yes, we normally get the letter, and that letter we used as the acknowledgment to go forward in the process, that ACRS didn't have any comments on a procedure in the Reg Guide.

CHAIR SUNSERI: Yes, so we'll follow that process seems.

MR. GARDOCKI: Thanks.

MEMBER MARCH-LEUBA: This is Jose, and I know I'm playing a broken record but we have example today of two Reg Guides with members benefit from a memo type procedure where we do this P&P in a more formal way.

And, I know I keep pushing it, and you guys keep voting no but I, we need to do something that is simple, unpainful, and that satisfies everybody.

I'll leave it at that.

CHAIR SUNSERI: Thank you. Anyone else?

(No audible response.)

CHAIR SUNSERI: Okay, well thank you to the staff for the presentation today. Thank you to the members for your attention, and at this time we are adjourned.

Have a good day.

(Whereupon, the above-entitled matter went off the record at 3:09 p.m.)

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Draft Regulatory Guide 1.244 Control of Heavy Loads at Nuclear Facilities

Steven Jones, Acting Chief
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Presentation to the Advisory Committee on Reactor Safety, Subcommittee on Regulatory Policies and Practices

November 16, 2021

Agenda

1. Introduction
2. Existing Guidance
3. Proposed New Guidance
4. Safety Significance
5. Response to Public Comments
6. Conclusion

Introduction

- Purpose of RG 1.244:
  - Endorse appropriate consensus standards for control of heavy loads
  - Update guidance contained in current technical reports
  - Expand applicability to include lifting devices used for major component replacement and spent fuel storage
- These consensus standards provide updated guidance for heavy load handling programs, including:
  - methods to assure safety functions are accomplished considering equipment failures and effects of natural phenomena
  - standards for operation, maintenance, and testing of handling systems, especially enhanced reliability systems

Existing NRC Guidance

- NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants”
  - Provides criteria for protection of safety functions
  - Specifies good practices for the handling of heavy loads
- NUREG-0554, “Single Failure-Proof Cranes for Nuclear Power Plants”
  - Provides criteria for crane design, fabrication, and testing
  - Specifies features to control load following component failures, natural phenomena, and operator errors
- ANSI N14.6, “Radioactive Materials—Special Lifting Devices for Shipping Containers Weighing 10 000 Pounds (4500 kg) or More for Nuclear Materials”
  - Provides criteria for lifting device design and testing
  - Specifies inspection and testing to verify continued compliance

Proposed Endorsed Standards

- American Society of Mechanical Engineers (ASME) Standard NML-1-2019, "Rules for the Movement of Loads Using Overhead Handling Equipment in Nuclear Facilities"
  - Replacement for NUREG-0612
  - Qualitative risk-informed approach
  - Scope expanded for wider use at nuclear facilities
  - Updated to reflect operating experience
    - Restrictions on use of slings
    - Simplified testing for special lifting devices

Proposed Endorsed Standards (cont.)

- ASME Std. NOG-1-2020, “Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)”
  - Replacement for NUREG-0554
  - Reflects current technologies
- ASME Std. BTH-1-2017, “Design of Below-the-Hook Lifting Devices,” Chapters 1-3 (mechanical devices)
  - Provides criteria for the design and fabrication of special lifting devices and load lifting attachments
  - NML-1 and BTH-1 combined address scope of ANSI N14.6

Effect of New Guidance

- The staff expects endorsement of these three industry consensus standards to provide safety and efficiency benefits.
  - Incorporates lessons from several decades of operating experience
    - Administratively restricts sling usage to straight connections to specially designed attachment points or basket configurations around large diameter rounded objects for safety-significant lifts
    - Reduces design margin and burden of testing special lifting devices based on high reliability
    - Wire rope cranes take advantage of new designs to eliminate risk from two-blocking and provide controlled lowering systems
  - Standardization of programs and training
    - Many lifts conducted by contracted personnel during refueling outages
    - Adds riggers to scope of training included in program to reduce risk of below-the-hook errors
- Flexible guidance included for special conditions
  - Large component replacement (e.g., Steam Generator Replacement)
  - Space/structural limitations preclude NOG-1 crane
  - Outside nuclear power plant structures (e.g., ISFSI Operations)

Safety Significance

- Standard nuclear overhead handling systems provide reliable performance
  - Less than one uncontrolled motion per 10,000 lifts based on operating experience
  - Suitable when safety function would not be challenged by handling system failure
  - NML-1 provides acceptable controls for standard and special lifts
- Enhanced safety handling systems
  - Reduce frequency of uncontrolled motion by 1 to 2 orders of magnitude
  - Suitable for NML-1 Nuclear Safety Critical Lifts when using crane designed to NOG-1, Type I criteria and appropriate lifting devices

Public Comment

- Availability of Draft Guide 1381 for public comment published in Federal Register on May 4, 2021
- Public comment period ended on July 5, 2021
- Nuclear Energy Institute provided 24 comments:
  - 11 related to clarification of specific items
  - 5 related to licensing basis change control process
  - 4 related to endorsement of additional standards
  - 4 related to enhance flexibility through credit for administrative controls or alternative design elements
- Two individuals provided additional comments that overlapped with NEI comments.

Changes to Draft Guide

- Background
  - ANSI-N14.6 and ASME BTH-1 relationship
  - Clarified that controlled ranges of motion and enhanced safety handling systems constitute complete acceptable methods of evaluation
  - Explained basis for sling restrictions during critical lifts
- Regulatory guidance
  - Seismic qualification of cranes used for nuclear safety critical lifts with controlled range of motion
  - Clarified criteria for alternative crane designs for critical lifts
  - Clarification of sling restrictions for critical lifts

Conclusion

- The staff is endorsing three industry standards
- The staff expects the revised guidance to provide safety and efficiency benefits
- The staff expects substantial adoption of NML-1 control of heavy loads program guidance through the provisions of licensing basis change control regulations