

M-4

#### Doel Debrief

Objective: Common understanding of the status of Doel and Tihange and definition of potential next steps for U.S.

#### Highlights of trip:

Several pieces of other vessels will be destructively examined to identify nature of flaws and NDE response

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#### Next steps:

FOIA and confidential material

Leeds needs debrief

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ET meeting on Thursday

One pager for Chairman

Potential Commissioners TA brief

Trip report and daily note

Public meeting in December

Bilateral with France in December

Need to inspect? Need for document review?

Need to return for additional consultation...availability of funds

3-1

Metallurgical Aspects Influencing the Potential for Hydrogen Flaking in Forgings for Reactor Pressure Vessels

1. Background/Purpose

Ultrasonic testing (UT) was performed on the reactor vessel shell of Doel 3, a Belgian pressurized water reactor, during June-July 2012. (b)(4)

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The purposes of this document are:

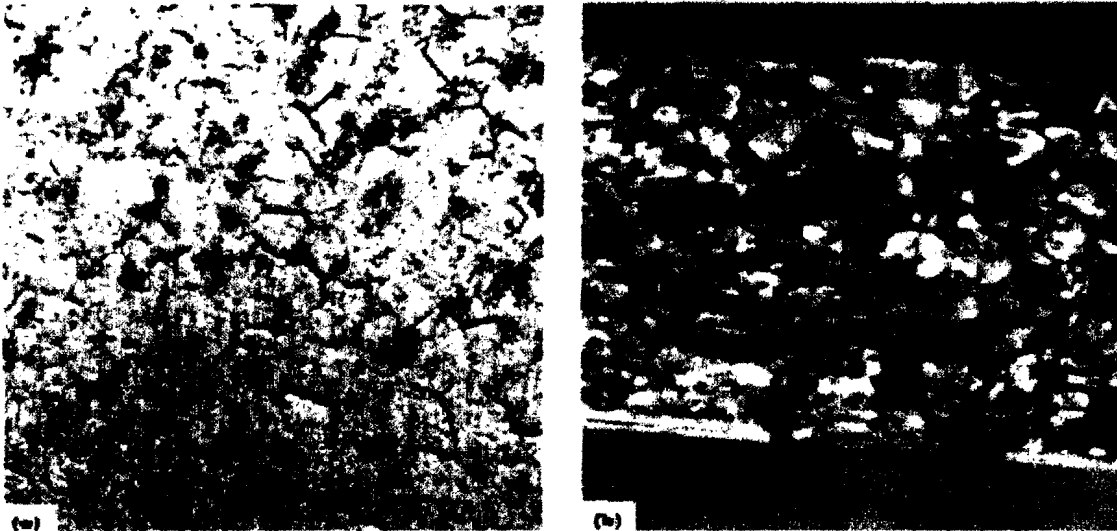
1. To summarize the NRC staff's state of knowledge regarding hydrogen flaking of steel forgings;
2. Provide background for NRC staff participation in the metallurgical/root cause working group;
3. Assess the potential of forgings in U.S. plants reactor pressure vessels to have (b)(4)
4. Identify indicators that U.S. plants could use to screen for susceptibility to flaking.

2. What is hydrogen flaking?

Hydrogen flakes (Figure 1) are short, discontinuous internal fissures caused by stresses produced by localized transformation and decreased solubility of hydrogen during cooling (Ref. 1). Hydrogen flaking is also referred to as internal hairline cracking, snow flakes, and shatter cracking.

The primary source of hydrogen is water vapor which in the atmosphere, furnace charge materials, slag ingredients and alloy additions, refractory linings, and ingot molds. The water vapor reacts with the liquid metal at high temperatures to form hydrogen. Hydrogen solubility is much higher in molten steel (5-12 ppm) than in solid steel at room temperature (0.1 ppm). Therefore, as the steel cools the hydrogen precipitates in molecular form at imperfections such as inclusions, grain boundaries, or microvoids. The high pressures of this gaseous hydrogen causes localized cracking. Formation of flakes generally occurs at temperatures below 390°F (Ref. 2). Flakes appear as small shiny spots on a fracture surface (hence the name "snow flakes

or flakes"). Flakes tend to be located in bands in the midline of the forging, up to 1/3 of the radius from the surface.



**Figure 1 – Hydrogen Flaking. Left – Flakes on polished cross section of an alloy steel bar. Right – Fracture surface containing flakes**

Other types of forging discontinuities include laps and seams, which are surface defects, bursts, pipe, and porosity. Of these, only bursts are subsurface defects that are cracklike. Bursts are caused by a forging temperature that is too low, or a forging process that is inadequate to work the metal through its entire cross section, or internal weakness due to pipe, porosity, segregation or inclusions. Bursts would typically be larger and less numerous than flakes, and are often located near the center of the forging if related to the forging process. Therefore, it is unlikely bursts would be mistaken for flaking.

### 3. History of Hydrogen Flaking

Producers of forgings have long known of the potential for hydrogen flaking. It was recognized as early as the 1920's that flaking was related to hydrogen (Ref. 3). During the 1950's, with the use of forged turbine rotors in steam power plants at higher temperatures and pressures, flaking became more of a problem and several costly failures occurred. Additionally, ultrasonic examination technology was also introduced during this time period, which allowed deep seated defects to be more readily detected. These problems with flaking led to the development of more efficient degassing processes to be applied during steelmaking to reduce the hydrogen levels in the ingot. These degassing procedures, mainly the vacuum stream and vacuum lift procedures, were well established the time period (late 1960's) when forgings for first-generation commercial nuclear power plants were being manufactured.

#### 4. Forgings for Nuclear Reactor Pressure Vessels

Forging for reactor pressure vessels (RPVs) were procured to specification ASTM A 508, "Standard Specification for Quenched and Tempered Vacuum-Treated Carbon and Alloy Steel Forgings for Pressure Vessels (Ref. 4)". This specification was initially published in 1964. Earlier forgings were mainly ASTM A 508, Grade 2. Due to problems with underclad cracking, A 508 Grade 3 was developed. Both are low-alloy steels containing manganese, nickel, and molybdenum, but Grade 2 also contains some chromium. The major modifications to Grade 3 are elimination of chromium, a lower maximum carbon, higher manganese, lower nickel, and lower molybdenum.

##### Underclad Cracking

Underclad cracking was first identified in 1970 at a European RPV fabricator (Ref. 5). Underclad cracks occur immediately beneath the cladding as a result of the cladding process. Cladding is a thin layer of austenitic stainless steel applied to the inner surfaces of the RPV via a weld process. Two types of underclad cracking have been identified, reheat cracking and cold cracking. Reheat cracking occurred during post weld heat treatment of single-layer austenitic stainless steel cladding applied using a high heat input welding process to ASTM A 508, Class 2 forgings. Cold cracking occurred in multi-layer clad ASTM A 508, Class 3 forgings after deposition of the 2<sup>nd</sup> and 3<sup>rd</sup> layer of cladding, when no preheat or postweld heat treatment was applied. The cracking is caused by high residual stresses in the heat affected zone of the cladding combined with high levels of diffusible hydrogen originating from the austenitic or stainless steel weld metal. Both types of underclad cracks originate at the clad/base metal interface and penetrate into the base metal, and are shallow, with reheat cracks typically confined to 0.125 inches in depth and cold cracks typically less than 0.160 inches, although the largest measured was 0.295 inches. Length could be up to 2 inches for cold cracks but more typically are less than 0.6 inches.

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##### Nuclear Industry Experience with Hydrogen Flakes

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## 5. Production Sequence for RPV Forgings

Production of large steel forgings for pressure vessels involves many steps as detailed below. For an RV shell forging, these steps include, as a minimum, melting, pouring, forging, machining, and NDE. Optional steps may include refining of the molten heat of steel in a ladle refining furnace (LRF) prior to pouring the ingot, and remelting of the ingot.

### Melting

Heats of steel to be poured into ingots or blooms for later forging have historically been produced by a number of different steelmaking processes. Steelmaking processes evolved during the last century to allow production of steel with fewer impurities, resulting in fewer inclusions in the steel.

- Acid or basic air-blown furnace, open hearth furnace, basic oxygen (oldest process)
- Acid open hearth – relief from hydrogen problems at expense of cleanliness
- Basic open hearth – cleaner steel but more hydrogen
- Basic electric furnace – cleanest steel but most hydrogen. This is the most modern process. The furnace is charged with scrap or pig iron. This is the process specified by ASTM/A-508. Japan Steel Works (JSW) uses this process.

### Vacuum Degassing

Vacuum degassing processes refer to the exposure of molten steel to a low-pressure environment to remove gasses (chiefly hydrogen and oxygen) from the steel (Ref. 7, 8) Problems with turbine rotor hydrogen flaking in late 1950's prompted installation of vacuum degassing equipment. Vacuum degassing processes can be broadly divided into stream

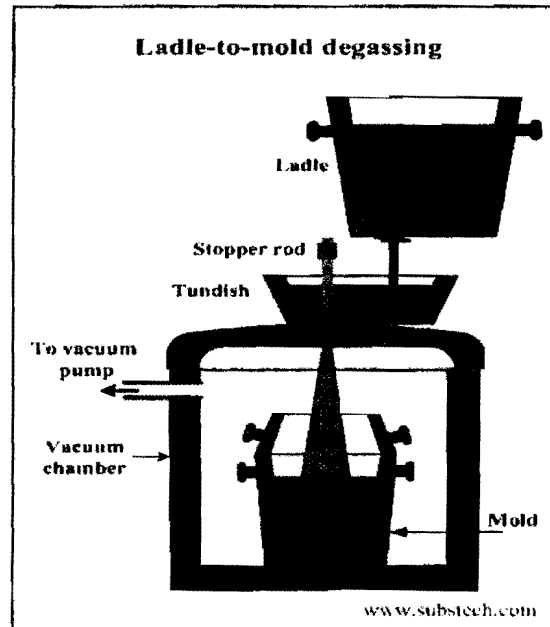
processes and recirculation processes. Stream processes include ladle-to-ladle degassing and ladle-to-mold degassing and involve degassing the whole heat continuously, while recirculation processes, draw a portion of the molten heat into a smaller vacuum chamber in which the degassing takes place. In ladle-to-mold degassing, shown in Figure 2, the molten steel is poured from a ladle into the ingot mold which is inside a vacuum tank. As the molten steel exits the "pony ladle," it forms a stream of droplets in the vacuum tank, exposing a large surface area of the molten steel thus allowing efficient degassing of the heat. Figure 3 shows a schematic of the Ruhrstahl-Heraeus (R-H) recirculation degassing process. In the R-H process, a vacuum vessel with two legs or "snorkel tubes" is lowered such that the snorkel tubes are immersed in the molten steel. An inert gas is introduced into one of the legs and the lower density of the gas steel mixture cause the steel to flow up that leg into the vacuum chamber where it is degassed and flows back down the other leg via gravity.

The D-H process is another common recirculation degassing process in which the vacuum vessel is lowered so that the molten steel in the ladle is forced up into the vessel through a single snorkel tube on the bottom of the vessel, by atmospheric pressure. The vessel is then raised allowing the steel to flow back into the ladle. The cycle is repeated 40 to 50 times. In both the R-H and D-H processes, alloying additions can also be made through the hopper while degassing.

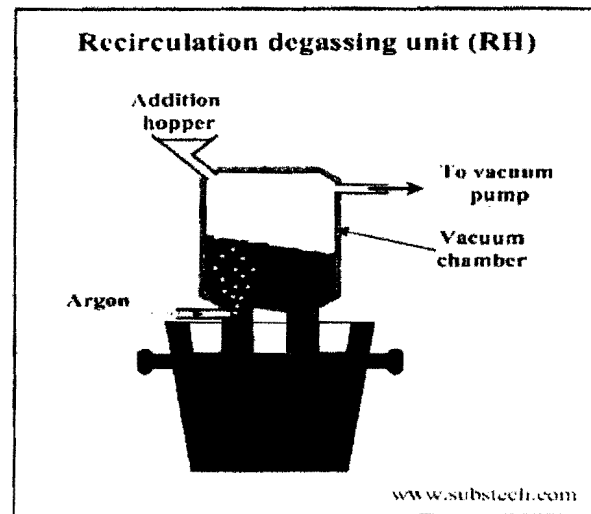
ASTM A508 requires that "the steel shall be vacuum treated prior to or during the pouring of the ingot, in order to remove objectionable gasses, particularly hydrogen." A508 does not restrict the degassing to certain processes, but does place specific requirements on particular processes if they are used. Notably, the blank-off pressure (final pressure) required for both vacuum stream and vacuum lift processes is the same, 1000  $\mu\text{m}$  (1 Torr). (vacuum lift is synonymous with recirculation degassing). Reference 3 indicates that vacuum stream degassing is the preferred process for making large forging ingots using multiple heats.

A secondary benefit of vacuum stream degassing is that carbon in the molten steel reacts with oxygen to produce carbon monoxide, which is removed by the degassing process, thus deoxidizing the steel without requiring the addition of aluminum or silicon (which leaves behind aluminum or silicon oxide inclusions). Silicon must be limited to 0.10% for this process to be effective. Recirculation degassing processes perform this vacuum carbon deoxidization process less efficiently.

Reference 3 notes that reducing hydrogen content below 1.5 ppm in the ingot is very difficult, because the practical limit for degassing of the molten steel is 1 ppm, and some hydrogen pickup during casting (0.2 to 0.8 ppm) is inevitable.



**Figure 2 – Schematic Arrangement of Ladle-to-Mold Degassing Process**



**Figure 3 – Schematic of the Ruhrstahl-Heraeus (R-H) Process for Vacuum Degassing, a Recirculation Degassing Process**

### Refining

While still in the molten state, the steel can be refined to remove impurities such as sulfur and to make alloying additions. This is typically done in a ladle refining furnace (LRF) which is a separate vessel to which the heat of molten steel is transferred prior to pouring. The various types of LRF have the capability to stir and reheat the molten steel. Some LRF processes can also degass.

Argon Oxygen Decarburization (AOD) is a process typically used for stainless steel production to economically decarburize the steel via controlled blowing of argon and oxygen. Carbon dioxide and monoxide formed by reaction with the oxygen are swept away by the argon before equilibrium is established. AOD can also effectively reduce the sulfur in low-alloy steels. AOD can also reduce hydrogen, but not lower than 2 ppm, therefore this process does not replace vacuum degassing.

### Pouring/Casting

Ingots for large forgings such as RPV shell forgings are some of the largest forging ingots (Figure 4). These ingots may require multiple heats of steel, thus may have more variability in chemical composition than smaller ingots. Due to the longer times required for solidification, large ingots also tend to have a larger degree of segregation than smaller ingots. Segregation is caused by the rejection of the solutes from a solidified alloy into the liquid phase. This rejection is a result of different solubility of impurities in liquid and solid phases at the equilibrium temperature. Macrosegregation refers to differences in the chemical composition over a large scale. Positive segregation refers to enrichment in alloying elements and impurities (solute) while negative enrichment refers to relative depletion of alloying elements and impurities (solute). Figure 5 is a diagram of macrosegregation in a large steel ingot. There are differences not only in chemical composition but grain structure, distribution of inclusions, and other defects such as porosity and shrinkage cavities.

Since segregation is most prevalent in the last material to solidify, these large ingots are often cast with a "hot top," or "sinkhead" which is a portion of the ingot at the top of the mold which is cut off before forging. Trepanning to remove material from the core of the ingot also eliminates one of the most segregated regions. Nonmetallic inclusions tend also to segregate during ingot solidification, especially towards the top and bottom, giving rise to the so-called inverted "V" or "A" and "V" segregates, respectively (Ref. 7). The hot work imparted by the forging process reduces the effects of segregation by breaking up and redistributing the segregated regions, and grain refinement through recrystallization.

Ingots may be top or bottom poured, denoting whether the molten steel enters the mold from the top or the bottom. Bottom-poured ingots are less likely to experience reoxidation during pouring and have smoother surfaces; however, if vacuum stream degassing is used, ingots must be top-poured.

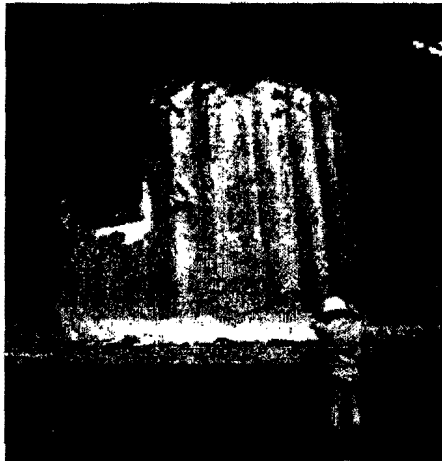


Figure 4 – A 600-ton Low-Alloy Steel Forging Ingot at Japan Steel Works

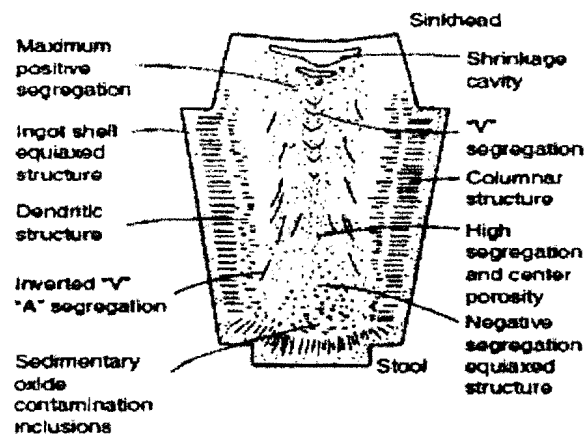


Figure 5 – Macrosegregation in a Large Steel Ingot (Ref. 13)

### Remelting

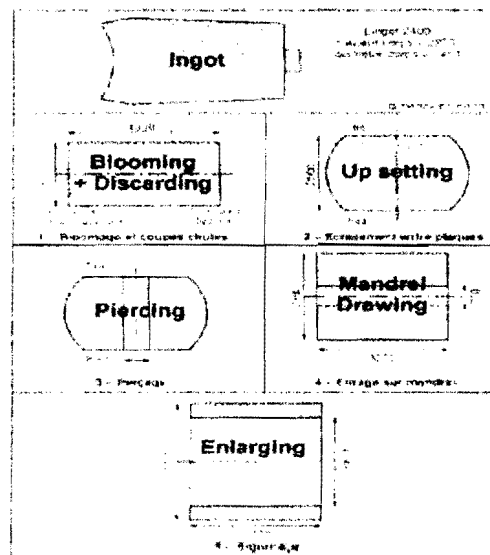
Several refining processes are available that involve remelting the ingot. Vacuum arc remelting (VAR) refines the grain structure and reduces segregation in the ingot, as well as degassing. Electroslag remelting (ESR) has similar benefits to VAR, but does not degass. Due to the high

cost, both these processes are usually used only for specialty steels, thus would probably not be used for large low-alloy steel pressure vessel forging ingots.

### Forging

The actual forging process for a large, cylindrical ring forging for a pressure vessel involves multiple steps. The operations involved will differ depending on the manufacturer. The sequence provided below is partially based on information from the Doel 3 root cause investigation in Reference 9, depicted in Figure 6, as modified by information from References 7 and 8. These processes are mainly open die forging processes using hydraulic presses.

1. Cogging – A process to smooth the surfaces of the ingot, which is typically fluted to prevent cracking of the ingot during solidification or cooling
2. Blooming – Metal removal to smooth out ingot? (Doel Presentation)
3. Upsetting – An open die forging process that compresses the ingot axially to increase the diameter of the forging
4. Piercing or punching – Makes a hole in the center of the ingot by displacing material. No material is removed.
5. Hot trepanning or trephining – Makes a hole by means of a hollow punch that removes some of the central material of the ingot
6. Mandrel drawing – Reduces the wall thickness and extends the length of the cylinder
7. Ring rolling – Rotary forging of a hollow cylindrical forging to increase its diameter while maintaining the axial length (Figure 7).



**Figure 6 – Reconstituted Forging Sequence for Doel 3 RV Shells (Ref. 9)**

Whether punching or hot trepanning is used is important in that punched (pierced) ingots will have a larger degree of macrosegregation since the most highly segregated portion of the ingot is not removed as it is in trepanning.

Prior to forging, the ingot must be heated to the forging temperature. Heating for large ingots would typically be done in a gas-fired car-bottom furnace. Forging temperature must be carefully chosen to optimize the properties of the finished forging but is always above the recrystallization temperature of the steel. Excessive forging temperatures can result in "burning" of the steel, in which low-melting constituents of the steel melt, while temperatures which are too low can cause forging bursts. Finishing the forging at a lower temperature results in a finer grain size. Sometimes reheating between the various forging operations is necessary.



**Figure 7 – Ring Rolling Forging Operation for Nuclear Pressure Vessel (Doosan Heavy Industries)**

#### Post-Forging Practices

Prior to vacuum degassing, forgings were often cooled in the furnace, under an insulated hood or in a refractory insulating medium to prevent flake formation. This slow cooling was then followed by an extended subcritical heat treatment (sometimes after reaustenitizing to refine the grain structure). For higher-hardenability alloy steels, these practices are still used to prevent flaking. Controlled cooling also reduces hardness and internal stresses (which also contribute to flaking). Since flaking is a delayed process, occurring 2 to 20 days after hot working (Ref. 3), it is desirable to perform special heat treatments to prevent flaking promptly after hot working, sometimes without allowing cooling to room temperature. With modern temperature control, some steels, depending on the transformation characteristics, can be quenched to a certain temperature, allowed to transform, and then cooled to room temperature, while other steels need to be heated up from the transformation temperature to a higher temperature, and then held for a certain time, for flake prevention (Ref. 8). To reduce the possibility of flaking,

Reference 3 recommends cooling to a temperature above 390 °F (200 °C), but below the temperature for complete transformation to bainite, holding to ensure complete transformation, then reheating to a temperature around 1112 °F (600 °C) to temper the bainite (Figure 8).

Whether or not the special heat treatment for flaking is performed, forgings are then heat treated to achieve the desired mechanical properties, typically by quenching and tempering.

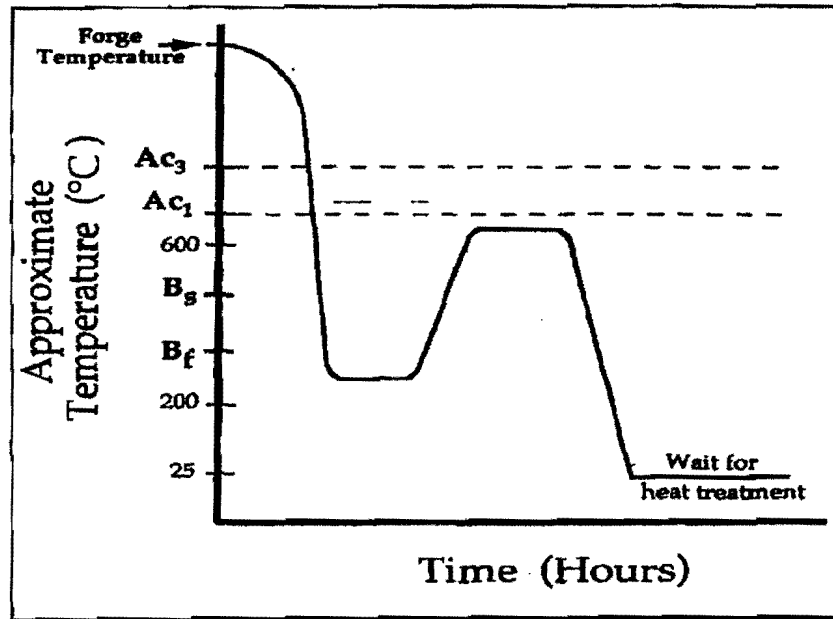


Figure 8 – Schematic Diagram of a Hydrogen Flaking Prevention Heat Treatment (from Reference 7)

#### Machining

Machining is typically performed after forging and heat treatment to the extent necessary to perform UT, with final machining performed after the UT examination. Per ASTM A388, "Standard Practice for Ultrasonic Examination of Heavy Steel Forgings (Ref. 10)," round forgings shall be machined to provide cylindrical surfaces for examination and the end of the forging shall be machined perpendicular to the axis of the forging for the axial examination. UT of the forging volume must be performed prior to the machining of any openings such as holes, cutting keyways, tapers, grooves.



### Non-Destructive Examination

Ultrasonic examinations are required by both the ASTM material specification (A 508) and ASME Code, Section III. A 508 requires longitudinal wave and angle beam tests. Complete loss of back reflection or an indication equal in amplitude to that of the back reflection in a defect-free portion of the forging, would be cause for rejection. For the angle beam, calibration is accomplished using notches of 3% of the nominal section thickness. ASTM A388 is referenced.

ASME Code, Section III UT acceptance criteria for vessel shell forgings (NB-2540) essentially would cause forgings to be rejected for reflectors in the same plan within a certain radius.

Surface examination via magnetic particle testing (MT) is required by A508 after final machining. For forgings with extensive machining, such as nozzle forgings, if hydrogen flaking were present in the forging, machining would probably expose the flaking to the surface such that it would be detected by the MT.

### Welding

RV shell forgings are joined via circumferential full-penetration welds to form larger subassemblies which are finally assembled into a complete RV. After each weld, the subassemblies are subject to post-weld heat treatment. The stainless steel cladding is typically applied to the shells before the shells are joined into subassemblies, with the cladding then completed in the weld area once the segments are joined.

## 6. Factors Influencing Hydrogen Flaking

### Metallurgical Factors

Any factor that lowers the toughness of the material matrix will lower the resistance to cracking due to hydrogen. These factors include larger grain size, and lower toughness microstructures, such as martensitic or bainitic microstructures. Hydrogen is also known to be trapped by grain boundaries, therefore, steel with larger grains has less grain boundary area, thus the concentration of hydrogen at the grain boundaries is greater. Tramp elements such as phosphorus, tin, arsenic and antimony are known to segregate to grain boundaries along with manganese and silicon, which reduces grain boundary cohesive strength, making the steel more prone to hydrogen embrittlement (Ref. 3).

Nonmetallic inclusions and segregation are metallurgical factors that contribute to flaking. Manganese Sulfide (MnS) inclusions are weak hydrogen traps in that they trap hydrogen below 300 °C (Ref. 3). However, if the number of MnS inclusions is reduced, more hydrogen will accumulate at each inclusion (Ref. 3). Therefore, in low sulfur steels, flaking can occur at a lower hydrogen concentration (Ref. 3). Freuhan (Ref. 3) defines a low sulfur steel as having a sulfur content < 0.02 weight %. Modern steelmaking practices can reduce sulfur as low as 0.005 weight %. Oxides can also trap hydrogen. Therefore, very clean steels, which are low in

oxygen and sulfur, mainly produced since the 1980's, may have an order of magnitude lower density of inclusions. Therefore, the ultraclean steels can have an increased susceptibility to flaking at lower hydrogen concentrations because the hydrogen concentration at each inclusion will be greater (Ref. 3).

Inclusion shape can also influence flaking, because long narrow inclusions have greater potential to create a stress concentration. Reference 3 indicates that in general, larger, more elongated inclusions are more prone to flake problems. The tip of an inclusion often acts as a stress riser.

Segregation refers to local differences in chemical composition within the steel. The later the material solidifies during the solidification of the ingot, the more enriched in solute it becomes (a solute would typically be an alloying element, for example chromium or nickel), due to the greater solubility of such elements in the liquid versus the solid. Segregation affects flaking in two ways. Areas of positive segregation (i.e. higher in alloying element content) will transform at a lower temperature, therefore are more likely to transform to low-toughness phases such as martensite. Second, areas of positive segregation will contain more elements that create hydrogen traps. It should be noted that all large ingots will contain significant areas of segregation.

#### Hydrogen Content

Various thresholds have been defined with regard to the maximum hydrogen concentration in the forging to prevent hydrogen flaking. For hydrogen-insensitive steels, which generally means lower-hardenability steels, a threshold hydrogen content of 5 ppm has been proposed (Ref. 2). However, for more hydrogen-sensitive steels, a maximum of 1.5 ppm to 2 ppm is generally recognized (Ref. 3, 7).

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Hydrogen is controlled by degassing as discussed in Section 4, but ladle additions after degassing can be a potential source of increased hydrogen and the molten steel can pick up hydrogen from atmospheric moisture during teeming (transfer of molten steel to the ingot mold).

#### Section Thickness

As section thickness increases, reduction of hydrogen by thermal treatment becomes impractical due to the long times required. For example, Reference 3 presents data showing the almost 300 hours would be required to reduce hydrogen at the center of a 36 inch (90 cm) radius forging from 4 ppm to 2 ppm if held at 1260 °F (700 °C).

#### Steel Hardenability

Higher hardenability steels are more likely to have lower fracture toughness and a more susceptible to hydrogen embrittlement. Therefore, a lower hydrogen concentration will be required to cause flaking. Examples of high hardenability steels include medium carbon steels, nickel-chromium-molybdenum alloy steels (e.g. Type 4340), and age-hardenable copper-nickel-chromium-molybdenum low alloy steels (ASTM A859) (Ref. 7).

### Post-Forging Handling

As discussed in Section 4, improper cooling practices, such as excessively rapid cooling, or transforming at a temperature below 390 °F, or lack of a dehydrogenation heat treatment, could increase the flaking susceptibility.

### Summary – Factors Increasing Flaking Susceptibility

- Metallurgical factors
  - Steel cleanliness –impurities create lots of inclusions which are collection sites for hydrogen
  - Ultra-clean steels
  - Segregation
- Hydrogen content in forging > 5 ppm, >1.5 ppm for sensitive steels
- Poor or no hydrogen control
  - No vacuum degassing
  - Moisture-bearing ladle additions after degassing
  - Teeming under humid conditions if degassed
  - Melting under high-humidity conditions
- Heavy sections
- High hardenability steels
  - Medium to high carbon steels
  - Nickel-chromium-molybdenum alloy steels (very susceptible)
  - Age-hardenable copper-nickel-chromium-molybdenum low alloy steels (ASTM A859) – not used in RPV
- Post-forge practices
  - Rapid cooling after hot working (forging)
  - Allowing to transform below 390 °F.
  - Lack of a de-hydrogenation thermal treatment, particularly if not vacuum degassed

### Summary - Factors Mitigating Hydrogen Flaking

- Effective Vacuum Degassing, hydrogen < 1.5 ppm in melt or ingot
- Proper treatment after hot working
  - Controlled cooling after hot working
  - Prevention of transformation at temperatures below 390 °F
  - Separate de-hydrogenation thermal treatment, if needed for the grade of steel and considering whether degassing is performed
- Lower hardenability steels
- Thinner sections

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#### State of Knowledge Regarding Susceptibility of Forgings in US Plants

Based on the Reactor Vessel Integrity Database (RVID) the staff determined there are 31 US plants that have large cylindrical forgings that make up major parts of the RV shell in the beltline region. However, most if not all RV's use forgings for major nozzles such as PWR reactor coolant hot and cold leg (inlet and outlet nozzles), and BWR reactor recirculation inlet and outlet nozzles. Many RVs also have forgings for the nozzle shells, even if the core region shells are made from welded plate. These nozzle shell forgings and nozzle forgings were not considered to be in the beltline so are not generally in RVID. However, some nozzles and nozzle belt forgings have been included as extended beltline materials in license renewal application. Also, many RV closure heads are forgings and many bottom heads are also forgings. Since these are non-beltline materials they are not tracked in RVID. → publicly available

The forgings in US RVs are all A508 Class 2 or A508 Class 3. Several different manufacturers used forgings for the major shell segments including Rotterdam Dockyard, Babcock & Wilcox, Chicago Bridge & Iron, Combustion Engineering, Societe Creusot, and Hitachi. All these large forgings were supplied by one of five manufacturers: Bethlehem Steel, Creusot-Loire, Japan Steel Works, Ladish, or RDM. Attachment 1 provides additional detail and tabulation of the data on forgings from RVID.

publicly available  
Eight U.S. reactors have forgings partially or completely fabricated by RDM, which forged the Doel 3 core shells and also the Tihange 2 core shells under the same contract. Three reactors had some fabrication performed by RDM, but it is unclear whether these plants have any forgings made by RDM. The NRC staff has not learned of any factors unique to the forging practices of RDM, or the practices used by Krupp in making the ingots, which would be unique or would increase the susceptibility to hydrogen flaking. The staff needs to obtain information on the production of forgings by the all the manufacturers in order to make meaningful comparisons to the Krupp and RDM practices.

The only manufacturers of large forgings for nuclear pressure vessels known to be currently active by the NRC staff are Japan Steel Works, and Doosan Heavy Industries (Korea).

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## Appendix 1 - U.S. Plants with Forgings

Revision 2 of the Reactor Vessel Integrity Database (RVID) lists 72 forgings in 33 US plants. RVID only contains those materials that are in the RV beltline. Of these, 64 are shell forgings, or large cylindrical forgings forming major segments of the RV, while 8 are nozzle forgings. Two of the 33 plants have only nozzle forgings listed. Therefore, there are 31 plants that have large cylindrical forgings that make up major parts of the RV shell. However, most if not all RV's use forgings for major nozzles such as PWR reactor coolant hot and cold leg (inlet and outlet nozzles), and BWR reactor recirculation inlet and outlet nozzles. Most of these nozzles are not in RVID since they were not considered beltline materials for the initial 40 years of operation.

The forgings in US RVs are all A508 Class 2 or A508 Class 3. Several different manufacturers used forgings for the major shell segments including Rotterdam Dockyard, Babcock & Wilcox, Chicago Bridge & Iron, Combustion Engineering, Societe Creusot, and Hitachi. All these large forgings were supplied by one of five manufacturers: Bethlehem Steel, Creusot-Loire, Japan Steel Works, Ladish, or RDM.

In addition, it was desirable to know for which RVs the forging was actually performed by Rotterdam Dockyard (RDM). The staff determined that eight reactors had forgings partially or completely fabricated by RDM. Three reactors had some fabrication performed by RDM, but it is unclear whether these plants have any forgings made by RDM.

Table A-1 lists all the RV forgings from RVID.

### Forging Manufacturers for New Plants

Manufacturers that are currently making nuclear pressure vessel forgings include JSW (Japan), and Doosan Heavy Industries (Korea).

Table A-1 – Plants With Forgings Fabricated by RDM

Plant Name	Comment
Catawba 1	
McGuire 2	
North Anna 1	
North Anna 2	
Sequoyah 1	
Sequoyah 2	
Watts Bar 1	
Watts Bar 2	Operating license application review in progress.



Table A-2 – Plants with Some Fabrication by RDM

Plant Name	Comment
Quad Cities 2	Bottom head assembly and lower shell course were seam-welded together by RDM and returned to the United States as a fully completed subassembly including control rod drive (CRD) stub tubes, shroud support skirt, and vessel support skirt.
Surry 1	RV fabricated primarily from plate, nozzle belt is a forging. Circumferential welds were made by RDM. It is not known whether the nozzle belt forging was forged by RDM.
Surry 2	RV fabricated primarily from plate, nozzle belt is a forging. Circumferential welds were made by RDM. It is not known whether the nozzle belt forging was forged by RDM.

Table A-3 - All Forgings from RVID

Plant	Designer	Reactor	Heat ID	Beltline	Material Spec.	Forging Supplier
Arkansas Nuclear 1	B&W	PWR	528360(AYN 131)	Lower Nozzle Belt Forging	A 508-2	
Braidwood 1	Westinghouse	PWR	5P-7016	Lower Nozzle Belt Forging	A 508-2	
Braidwood 1	Westinghouse	PWR	49D867-1-1/49C813-1-1	Lower Shell Forging	A 508-3	JSW
Braidwood 1	Westinghouse	PWR	49C344-1-1/49D383-1-1	Upper Shell Forging	A 508-3	JSW
Braidwood 2	Westinghouse	PWR	49D963-1-1/49C904-1-1	Upper Shell Forging	A 508-3	JSW
Braidwood 2	Westinghouse	PWR	5P-7056	Lower Nozzle Belt Forging	A 508-3	JSW
Braidwood 2	Westinghouse	PWR	50D102-1-1/50C97-1-1	Lower Shell Forging	A 508-3	JSW
Brunswick 1	GE	BWR	Q2Q1VW	Nozzle Forging N16a	A 508-2	
Brunswick 1	GE	BWR	Q2Q1VW	Nozzle Forging N16b	A 508-2	
Brunswick 2	GE	BWR	Q2Q1VW	Nozzle Forging N16b	A 508-2	
Brunswick 2	GE	BWR	Q2Q1VW	Nozzle Forging N16a	A 508-2	
Byron 1	Westinghouse	PWR	5P-5951	Lower Shell Forging	A 508-2	Ladish
Byron 1	Westinghouse	PWR	5P-5933	Int. Shell Forging	A 508-2	Ladish
Byron 1	Westinghouse	PWR	123J218	Lower Nozzle Belt Forging	A 508-2	Ladish
Byron 2	Westinghouse	PWR	49D329-1-1/49C297-1-1	Intermediate Shell Forging	A 508-2	JSW
Byron 2	Westinghouse	PWR	4P-6107	Lower Nozzle	A 508-2	JSW

Plant	Designer	Reactor	Heat ID	Beltline	Material Spec.	Forging Supplier
				Belt Forging		
Byron 2	Westinghouse	PWR	49D330-1-1/49C298-1-1	Lower Shell Forging	A 508-2	JSW
Catawba 1	Westinghouse	PWR	527708	Lower Shell 04 Forging	A 508-2	RDM
Catawba 1	Westinghouse	PWR	411343	Intermediate Shell 05 Forging	A 508-2	RDM
Crystal River 3	B&W	PWR	AZJ94	Nozzle Belt Forging	A 508-2	
Davis-Besse	B&W	PWR	5P4086 (BCC241)	Lower Shell Forging	A 508-2	
Davis-Besse	B&W	PWR	123Y317 (ADB 203)	Nozzle Belt Forging	A 508-2	
Davis-Besse	B&W	PWR	123X244 (AKJ233)	Upper Shell Forging	A 508-2	
Ginna	Westinghouse	PWR	125P666VA1	Lower Shell	A 508-2	
Ginna	Westinghouse	PWR	125S255VA1	Intermediate Shell	A 508-2	Beth Steel
Ginna	Westinghouse	PWR	123P118VA1	Nozzle Forging	A 508-2	
Hope Creek	GE	BWR	19468-1	Low Pressure Coolant Injection Nozzle Forging	A-508	
Hope Creek	GE	BWR	10024-1	Low Pressure Coolant Injection Nozzle Forging	A-508	
Kewaunee	Westinghouse	PWR	122K208VA1	Intermediate Shell B-6306	A 508-2	Beth Steel
Kewaunee	Westinghouse	PWR	123K167VA1	Lower Shell B-6307	A 508-2	Beth Steel
Mcquire 2	Westinghouse	PWR	411337-11	Lower Shell 04	A 508-2	RDM
Mcquire 2	Westinghouse	PWR	526840	Intermediate Shell 05	A 508-2	RDM
North Anna 1	Westinghouse	PWR	990311/298244	Intermediate	A 508-2	RDM

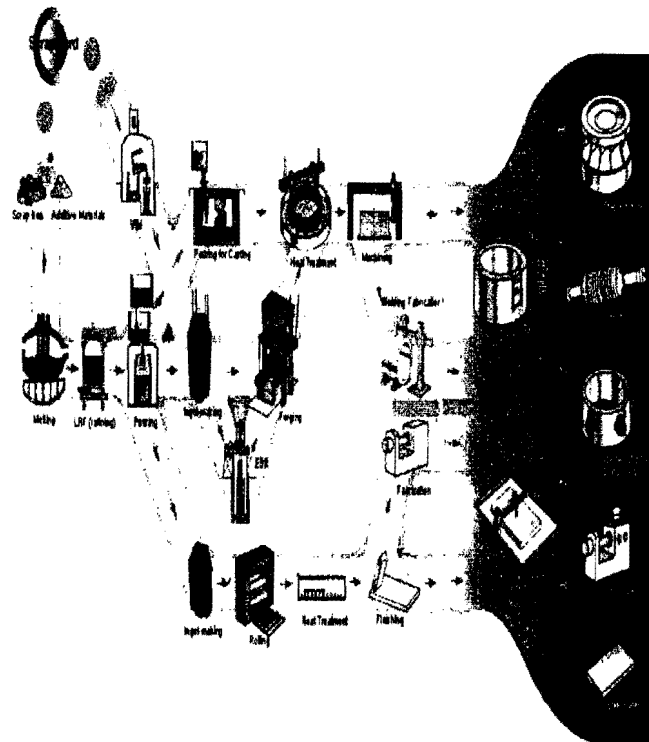
Plant	Designer	Reactor	Heat ID	Beltline	Material Spec.	Forging Supplier
				Shell Forging 04		
North Anna 1	Westinghouse	PWR	990286/295213	Nozzle Shell Forging 05	A 508-2	RDM
North Anna 1	Westinghouse	PWR	990400/292332	Lower Shell Forging 03	A 508-2	RDM
North Anna 2	Westinghouse	PWR	990598/291396	Nozzle Shell Forging 05	A 508-2	RDM
North Anna 2	Westinghouse	PWR	990496/292424	Intermediate Shell Forging 04	A 508-2	RDM
North Anna 2	Westinghouse	PWR	990533/297355	Lower Shell Forging 03	A 508-2	RDM
Oconee 1	B&W	PWR	AHR54 (ZV2861)	Lower Nozzle Belt	A 508-2	Ladish
Oconee 2	B&W	PWR	AWG-164 (4P1885)	Lower Shell Forging	A 508-2	Ladish
Oconee 2	B&W	PWR	AAW-163 (3P2359)	Upper Shell Forging	A 508-2	Ladish
Oconee 2	B&W	PWR	AMX-77 (123T382)	Lower Nozzle Belt Forging	A 508-2	Ladish
Oconee 3	B&W	PWR	AWS-192/522314	Upper Shell	A 508-2	Ladish
Oconee 3	B&W	PWR	ANK-191/522194	Lower Shell	A 508-2	Ladish
Oconee 3	B&W	PWR	4680	Lower Nozzle Belt Shell Forging	A 508-2	Ladish
Point Beach 1	Westinghouse	PWR	122P237	Nozzle Belt Forging	A 508-2	
Point Beach 2	Westinghouse	PWR	122W195	Lower Shell Forging	A 508-2	Beth Steel
Point Beach 2	Westinghouse	PWR	123V500	Intermediate Shell Forging	A 508-2	Beth Steel
Point Beach 2	Westinghouse	PWR	123V352	Nozzle Beltline Forging	A 508-2	Beth Steel
Prairie Island 1	Westinghouse	PWR	21887/38530	Lower Shell Forging D	A 508-3	Creusot-Loire
Prairie Island 1	Westinghouse	PWR	21918/38566	Int. Shell Forging	A 508-3	Creusot-

Plant	Designer	Reactor	Heat ID	Beltline	Material Spec.	Forging Supplier
				C		Loire
Prairie Island 1	Westinghouse	PWR	21744/38384	Nozzle Shell Forging B	A 508-3	Creusot-Loire
Prairie Island 2	Westinghouse	PWR	22231/39088	Nozzle Shell Forging B	A 508-3	Creusot-Loire
Prairie Island 2	Westinghouse	PWR	22829	Intermediate Shell Forging C	A 508-3	Creusot-Loire
Prairie Island 2	Westinghouse	PWR	22642	Lower Shell Forging D	A 508-3	Creusot-Loire
Sequoyah 1	Westinghouse	PWR	980919/281587	Lower Shell Forging 04	A 508-2	RDM
Sequoyah 1	Westinghouse	PWR	980807/281489	Intermediate Shell 05 Forging	A 508-2	RDM
Sequoyah 2	Westinghouse	PWR	288757/981057	Intermediate Shell Forging 05	A 508-2	RDM
Sequoyah 2	Westinghouse	PWR	990469/293323	Lower Shell Forging 04	A 508-2	RDM
Surry 1	Westinghouse	PWR	122V109VA1	Nozzle Shell Forging	A 508-2	
Surry 2	Westinghouse	PWR	123V303VA1	Nozzle Shell Forging	A 508-2	
Tmi-1	B&W	PWR	ARY 059	Lower Nozzle	A 508-2	
Turkey Point 3	Westinghouse	PWR	123P461VA1	Intermediate Shell Forging	A 508-2	Beth Steel
Turkey Point 3	Westinghouse	PWR	123S266VA1	Lower Shell Forging	A 508-2	Beth Steel
Turkey Point 3	Westinghouse	PWR	122S146VA1	Upper Shell Forging	A 508-2	Beth Steel
Turkey Point 4	Westinghouse	PWR	123P481VA1	Intermediate Shell Forging	A 508-2	Beth Steel
Turkey Point 4	Westinghouse	PWR	122S180VA1	Lower Shell Forging	A 508-2	Beth Steel
Turkey Point 4	Westinghouse	PWR	124S309VA1	Nozzle Belt Forging	A 508-2	

Plant	Designer	Reactor	Heat ID	Beltline	Material Spec.	Forging Supplier
Watts Bar 1	Westinghouse	PWR	528522	Lower Shell 04	A 508-2	RDM
Watts Bar 1	Westinghouse	PWR	527536	Intermediate Shell 05	A 508-2	RDM
Zion 1	Westinghouse	PWR	ANA 102	Upper Shell Forging	A 508-2	
Zion 2	Westinghouse	PWR	ZV 3855	Lower Nozzle Belt Forging	A 508-2	

Top of Form

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Main Facilities



120-ton Electric Arc Furnace



100-ton Electro-Slag Remelting



14,000-ton Water Hydraulic Forging Press



3,000-ton High-speed Hydraulic Forging Press



Heat Treatment Furnace



4-high Plate Mill



12,000-ton Pipe Forming Press



NC Lathe

Top of Form

JCN-N6783

Office of Nuclear Regulatory Research

Properties of CRDM Welds

Brady Hanson  
(509) 375-5051

Period of Performance: May 3, 2010–February 28, 2012  
Reporting Period: January 2012

**OBJECTIVE**

The objective of this project is to conduct nondestructive ultrasonic testing (UT), and an assessment of the leak path on Nozzle 63 from the North Anna Unit-2 reactor pressure vessel head. The assessment of the leak path will be conducted using instrumentation equivalent to or better than that used by industry. The results of the nondestructive examination will be compared to a previous assessment. A destructive analysis will be conducted to allow a visual assessment of the leak path. To the extent possible, the destructive analysis will be conducted such that materials from the nozzle and the J-groove weld that will be retained for later testing.

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**TECHNICAL PROGRESS**

Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE

Task 1 is complete.

Task 2: Perform Ultrasonic Measurements of the Leakage Path

Task 2 is complete.

Task 3: Perform Destructive Evaluation of Leakage Path

Task 3 is complete.

Nozzle 63 Cutting.

Cutting activity is complete.

Nozzle 63 Optional Work.

All optional work has been completed and the final report was received from B&W.

Nozzle 63 Data Analysis.

Data Analysis is complete.



**JCN-N6783**

**Task 4: Write NUREG/CR**

The NUREG/CR was finalized and submitted to the NRC for comments. The document includes data from an in-service-inspection vendor. Jack Lareau at WesDyne is seeking formal approval to include this data in the report.

**Task 5: Waste Disposal and Cleanup**

The J-groove weld was received at PNNL.

**Task 6: Project Management and Meetings**

None.

**MEETINGS AND TRIPS**

None.

**PROBLEM AREAS**

None.

**SCHEDULE OF MILESTONES AND DELIVERABLES**

Draft NUREG report submitted to NRC	January 16
NRC submit comments to PNNL	February 3
PNNL address comments	February 6–February 24
Submit final NUREG report	February 27
Project closeout	February 28

**PLANS FOR THE NEXT REPORTING PERIOD**

**Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE**

Complete.

**Task 2: Perform Ultrasonic Measurements of the Leakage Path**

Complete.

**JCN-N6783**

**Task 3: Perform Destructive Evaluation of Leakage Path Nozzle 63 Optional Work**

Complete.

**Task 4: Write NUREG/CR**

Receive and address comments from the NRC on the draft NUREG/CR. Issue the finalized version of the NUREG/CR to the NRC.

**Task 5: Waste Disposal and Cleanup**

The waste has been submitted, but has not been billed yet, but will be before the project is closed out in February.

**Task 6: Project Management and Meetings**

The cost for the subcontract to B&W has been accrued, but they have not issued the billing for all of the work. We will work with B&W to get that closed out prior to project closeout in February.

(b)(4)

**VARIANCE EXPLANATION**

None.

**EQUIPMENT**

None.

**QUALITY ASSURANCE**

The Quality Assurance requirements for this project are provided in the Laboratory's Standards Based Management System (SBMS). The SBMS allows for a graded QA approach to meet the requirements of individual projects. No specific Quality Assurance requirements have been specified by the NRC for this project.

(b)(4)

(b)(4)

Poehler, Jeffrey

2

**From:** Poehler, Jeffrey  
**Sent:** Wednesday, January 11, 2012 1:43 PM  
**To:** Kim, James  
**Subject:** RE: Draft Follow-Up RAI for Core Plate Bolt Analysis (ME6248)

Jim,

I'm scheduled to be working at home Tuesday – I can come in if necessary (b)(6)  
(b)(6) but I expect I should be able to make it in by afternoon. Or I can call in from home if you have a bridgeline.

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

**From:** Kim, James  
**Sent:** Wednesday, January 11, 2012 9:23 AM  
**To:** Poehler, Jeffrey  
**Subject:** RE: Draft Follow-Up RAI for Core Plate Bolt Analysis (ME6248)

Jeff,

Vermont Yankee wants to have a phone call to discuss your RAI on next Tuesday (1/17/12) afternoon. Please let me know whether you can support the phone call.

Thanks  
Jim Kim

**From:** Poehler, Jeffrey  
**Sent:** Wednesday, December 28, 2011 4:32 PM  
**To:** Kim, James  
**Cc:** Gonzalez, Hipolito  
**Subject:** Draft Follow-Up RAI for Core Plate Bolt Analysis (ME6248)

Jim,

Here is a draft of the follow-up RAI we discussed by phone last week. The RAI is currently in the concurrence process and I expect to be able to get the final to you by 1/5/12.

Maybe it would be prudent to arrange a conference call with the licensee to discuss the draft RAI.

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

B/S

Oberson, Greg

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From: Hanson, Brady D [brady.hanson@pnnl.gov]  
Sent: Tuesday, January 17, 2012 10:09 AM  
To: Oberson, Greg; MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D  
Cc: Hanson, Brady D  
Subject: RE: draft NUREG

B1246

Greg,

I was going through the draft yesterday getting it all ready to send before you got into the office today-

(b)(6)

(b)(6)

I will have it sent to you tonight.

Sorry for this delay- I really thought we had it in the bag.

Brady

---

From: Oberson, Greg [Greg.Oberson@nrc.gov]  
Sent: Tuesday, January 17, 2012 6:19 AM  
To: Hanson, Brady D; MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D  
Subject: draft NUREG

All,  
I'm hoping to receive a copy of the draft NUREG report by today. Please let me know if there'd be any delay in providing.

Thanks,  
Greg

**Nazario, Tomy**

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**From:** Nazario, Tomy  
**Sent:** Thursday, January 26, 2012 12:34 PM  
**To:** Haag, Robert  
**Subject:** Mockup for RPV Stud Hole Sleeving  
**Attachments:** Document.pdf

Bob,

The NRC has been notified that PCI/WEC will be performing a mock-up of the reactor pressure vessel (RPV) stud hole sleeving machining equipment and machining sequencing at their Lake Bluff, IL facility on March 16, 2012. The residents and the Regional Mechanical/Materials Branch have been closely following this activity to ensure that we fully understand not only the technical and engineering aspects of this remediation effort, but also observe the work as it is performed in the field.

Historically only three plants that we know of have sleeved RPV stud holes and those include Comanche Peak, DC Cook, and McGuire. Watts Bar Unit 2 has one stud hole that was sleeved during the manufacturing of the RPV flange and three additional holes that are scheduled to be sleeved in April. Therefore, this will be the only plant in the US that we are aware of to have a total of 4 sleeved RPV stud holes.

An NRC observation of this mock-up will be beneficial for the following reasons:

- This remediation effort is not routinely performed in the nuclear industry and this type of machining has not been performed since the 1990s.
- This would allow an NRC inspector(s) to become familiar with the machining equipment and the critical steps of the machining process. This machining equipment is custom made. No one in CCI or NRR currently has knowledge on this sleeving process.
- Once the PCI/WEC machinists are on-site, they get their work done efficiently and expediently, as observed with the machining of the stud hole threads. Therefore, during an NRC inspection, we may slow them down to gain knowledge of the process.
- The PCI/WEC machinists have time/schedule restraints and the NRC does not want to be the reason for delays.
- Observation of this mock-up would be considered part of the inspection preparation and planning
- It will allow the NRC to better determine what inspection specialization/assistance we may need before the work takes place.

I would recommend that the Regional Mechanical/Materials Branch (Scott Freeman's group) attend the mockup. Dave Failla has been very involved with reviewing the initial engineering evaluation and inspecting the machining of the RPV stud holes. We have also informed NRR of TVA's plans to sleeve the RPV stud holes last December. My only other recommendation would be that we ensure that the same individual that observes the mockup be the one to also be onsite when the sleeving takes place.

Please let me know if you have any questions.

Tomy

Tomy A. Nazario  
Senior Resident Inspector  
U.S. Nuclear Regulatory Commission

Watts Bar Nuclear Plant  
1260 Nuclear Plant Rd.  
Spring City, TN 37831

(b)(4)



## **Nazario, Tomy**

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**From:** Nazario, Tomy  
**Sent:** Thursday, January 26, 2012 12:35 PM  
**To:** Failla, David  
**Subject:** FW: Mockup for RPV Stud Hole Sleeving  
**Attachments:** Document.pdf; image001.gif

Here's what I sent bob. Thanks again.

**From:** Nazario, Tomy  
**Sent:** Thursday, January 26, 2012 12:34 PM  
**To:** Haag, Robert  
**Subject:** Mockup for RPV Stud Hole Sleeving

Bob,

The NRC has been notified that PCI/WEC will be performing a mock-up of the reactor pressure vessel (RPV) stud hole sleeving machining equipment and machining sequencing at their Lake Bluff, IL facility on March 16, 2012. The residents and the Regional Mechanical/Materials Branch have been closely following this activity to ensure that we fully understand not only the technical and engineering aspects of this remediation effort, but also observe the work as it is performed in the field.

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- Observation of this mock-up would be considered part of the inspection preparation and planning
- It will allow the NRC to better determine what inspection specialization/assistance we may need before the work takes place.

I would recommend that the Regional Mechanical/Materials Branch (Scott Freeman's group) attend the mockup. Dave Failla has been very involved with reviewing the initial engineering evaluation and inspecting the machining of the RPV stud holes. We have also informed NRR of TVA's plans to sleeve the RPV stud holes last December. My only other recommendation would be that we ensure that the same individual that observes the mockup be the one to also be onsite when the sleeving takes place.

Please let me know if you have any questions.

Tomy

(b)(4)

Oberson, Greg

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From: Hanson, Brady D [collaboration@pnnl.gov]  
Sent: Tuesday, January 31, 2012 12:50 AM  
To: Oberson, Greg  
Subject: You have files ready for pickup

53213

Hello,

Hanson, Brady D (brady.hanson@pnnl.gov) has sent you the following 1 file(s):

Subject: Files are available

Comments: Greg,

Here is the version with section 2 included. Kay is going over it to format the same as the other sections.

I also have some editorial changes as track changes and some comments for you to consider.

Sorry that this took so long to get to you. I have to work on it after hours so that I don't have to charge to the project. I want to make sure we have enough to cover Tony and Susan to address your comments. Also, Paul was supposed to help me on this but (b)(6)

(b)(6)

But hasn't been back to work since.

I will try to call you tomorrow.

Thanks,

Brady

The following files have been uploaded to the MassTransit Web File Transfer Services. You can download them by going to:

(b)(7)(F)

and selecting the file(s) and clicking Download (All/Selected).

NOTE: This link and contained passkey are only good for 14 days.

NUREG-011612.BDH1.docx (39.51M bytes)

This message was automatically generated from the PNNL FX Web File Transfer Service. If you have questions about its validity, please contact the sender listed above.

Office of Nuclear Regulatory Research

Properties of CRDM Welds

Brady Hanson  
(509) 375-3051

Period of Performance: May 3, 2010–July 31, 2012  
Reporting Period: February 2012

**OBJECTIVE**

The objective of this project is to conduct nondestructive ultrasonic testing (UT), and an assessment of the leak path on Nozzle 63 from the North Anna Unit-2 reactor pressure vessel head. The assessment of the leak path will be conducted using instrumentation equivalent to or better than that used by industry. The results of the nondestructive examination will be compared to a previous assessment. A destructive analysis will be conducted to allow a visual assessment of the leak path. To the extent possible, the destructive analysis will be conducted such that materials from the nozzle and the J-groove weld that will be retained for later testing.

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**TECHNICAL PROGRESS**

Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE

Task 1 is complete.

Task 2: Perform Ultrasonic Measurements of the Leakage Path

Task 2 is complete.

Task 3: Perform Destructive Evaluation of Leakage Path

Task 3 is complete and the final invoice from B&W was received and processed.

Task 4: Write NUREG/CR

Comments on the draft NUREG/CR were received from NRC and have been addressed. The report was resubmitted to NRC on February 28, 2012 for final review.

Task 5: Waste Disposal and Cleanup

All waste has been dispositioned and billed to the project and the task is complete.

Task 6: Project Management and Meetings

A revised statement of work and 189 spend plan has been submitted to facilitate PNNL supporting future activities (e.g., a March telecom) and addressing final comments on the NUREG/CR once received.

**MEETINGS AND TRIPS**

None.

**PROBLEM AREAS**

None.

**SCHEDULE OF MILESTONES AND DELIVERABLES**

Resubmit NUREG report	February 28
Receive and address NRC comments	by July 2012
Submit final NUREG/CR report	by July 30, 2012
Project closeout	July 31, 2012

**PLANS FOR THE NEXT REPORTING PERIOD**

**Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE**

Complete.

**Task 2: Perform Ultrasonic Measurements of the Leakage Path**

Complete.

**Task 3: Perform Destructive Evaluation of Leakage Path Nozzle 63 Optional Work**

Complete.

**Task 4: Write NUREG/CR**

Await final comments from NRC. Support NRC/industry teleconference.

**Task 5: Waste Disposal and Cleanup**

Complete.

**Task 6: Project Management and Meetings**

No meetings planned. Support NRC as necessary and await final comments on the report.

(b)(4)

**VARIANCE EXPLANATION**

None.

**EQUIPMENT**

None.

**QUALITY ASSURANCE**

The Quality Assurance requirements for this project are provided in the Laboratory's Standards Based Management System (SBMS). The SBMS allows for a graded QA approach to meet the requirements of individual projects. No specific Quality Assurance requirements have been specified by the NRC for this project.

(b)(4)

(b)(4)



Oberson, Greg

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**From:** Hanson, Brady D [brady.hanson@pnnl.gov]  
**Sent:** Monday, February 13, 2012 1:08 PM  
**To:** Oberson, Greg  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D; Hass, Kay E; Bisping, Lori S; Hanson, Brady D  
**Subject:** RE: follow up on draft NUREG and contract status

Greg,

(b)(4)

(b)(4)

Brady

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**From:** Oberson, Greg [<mailto:Greg.Oberson@nrc.gov>]  
**Sent:** Monday, February 13, 2012 9:44 AM  
**To:** Hanson, Brady D  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D  
**Subject:** RE: follow up on draft NUREG and contract status

Thursday should work. I recommend the same time.

---

**From:** Hanson, Brady D [<mailto:brady.hanson@pnnl.gov>]  
**Sent:** Monday, February 13, 2012 12:40 PM  
**To:** Oberson, Greg  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D  
**Subject:** RE: follow up on draft NUREG and contract status

Greg,

Can we do it on Thursday? I am on travel for DOE today through Wednesday.

I will have the cost estimate to you shortly.

Brady

---

**From:** Oberson, Greg [<mailto:Greg.Oberson@nrc.gov>]

**Sent:** Monday, February 13, 2012 9:32 AM

**To:** Hanson, Brady D

**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D

**Subject:** follow up on draft NUREG and contract status

All,

I propose that we have a telecon on Wednesday the 15<sup>th</sup> to discuss the status of the revisions to the NUREG report and the needs to extend the contract through the NRR review period. I'm happy to discuss with all of you if there are questions or concerns or I could discuss with Brady if there's just the need for a relatively brief status report. How about 1 PM ET/10 AM PT? Hopefully shouldn't take more than 30 minutes or so. Let me know about your availability.

Thanks,  
Greg

Oberson, Greg

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**From:** Oberson, Greg  
**Sent:** Tuesday, February 14, 2012 5:12 PM  
**To:** Hanson, Brady D  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D; Hass, Kay E; Bisping, Lori S  
**Subject:** RE: follow up on draft NUREG and contract status

All,

We can follow up with this on Thursday but I will give you a heads up...I received a request from Stephen Cumbledge that Tony and/or Susan support a proposed telecon with industry representatives on a potential ASME code case on leak path assessments. The meeting would probably be sometime around the middle of March. The purpose would be to provide some discussion of the methodology and preliminary results of our project so that industry would have a preview before moving ahead with a code case that may or may not be consistent with our findings. I expect it will be a fairly limited effort to prepare for the telecon and the telecon itself (maybe 6 hours each). I'll try to get Stephen to join the call on Thursday to provide more details. In any event, if you could support I would propose to provide urgent funding to cover that activity and provide a balance of funding to cover the NRR comments after I get a 189 spending plan. I will try to get a SOW modification to you guys by next week. Let me know if you have any questions before the meeting on Thursday. Thanks for your hard work.

Greg

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**From:** Hanson, Brady D [brady.hanson@pnnl.gov]  
**Sent:** Monday, February 13, 2012 1:08 PM  
**To:** Oberson, Greg  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D; Hass, Kay E; Bisping, Lori S; Hanson, Brady D  
**Subject:** RE: follow up on draft NUREG and contract status

Greg,

(b)(4)

(b)(4)

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**From:** Oberson, Greg [<mailto:Greg.Oberson@nrc.gov>]

**Sent:** Monday, February 13, 2012 9:44 AM

**To:** Hanson, Brady D

**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D  
**Subject:** RE: follow up on draft NUREG and contract status

Thursday should work. I recommend the same time.

---

**From:** Hanson, Brady D [<mailto:brady.hanson@pnrl.gov>]  
**Sent:** Monday, February 13, 2012 12:40 PM  
**To:** Oberson, Greg  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D  
**Subject:** RE: follow up on draft NUREG and contract status

Greg,

Can we do it on Thursday? I am on travel for DOE today through Wednesday.

I will have the cost estimate to you shortly.

Brady

---

**From:** Oberson, Greg [<mailto:Greg.Oberson@nrc.gov>]  
**Sent:** Monday, February 13, 2012 9:32 AM  
**To:** Hanson, Brady D  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D  
**Subject:** follow up on draft NUREG and contract status

All,

I propose that we have a telecon on Wednesday the 15<sup>th</sup> to discuss the status of the revisions to the NUREG report and the needs to extend the contract through the NRR review period. I'm happy to discuss with all of you if there are questions or concerns or I could discuss with Brady if there's just the need for a relatively brief status report. How about 1 PM ET/10 AM PT? Hopefully shouldn't take more than 30 minutes or so. Let me know about your availability.

Thanks,  
Greg

Oberson, Greg

---

**From:** Cinson, Anthony D [anthony.cinson@pnnl.gov]  
**Sent:** Wednesday, February 15, 2012 11:53 AM  
**To:** Oberson, Greg  
**Cc:** Crawford, Susan L; Hanson, Brady D  
**Subject:** RE: follow up on draft NUREG and contract status

Hi Greg,

Yes, that sounds like an awesome opportunity that I would like to participate in! Looking forward to our discussion tomorrow. One other thing about tomorrow's telecon, I neglected to put on my work calendar that we have a family dentist appt. tomorrow at 9:30 til 11am. Is there any way we could push our discussion to a little later time tomorrow?

Thanks,  
Tony

---

**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Tuesday, February 14, 2012 2:12 PM  
**To:** Hanson, Brady D  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D; Hass, Kay E; Bisping, Lori S  
**Subject:** RE: follow up on draft NUREG and contract status

All,

We can follow up with this on Thursday but I will give you a heads up...I received a request from Stephen Cumbledge that Tony and/or Susan support a proposed telecon with industry representatives on a potential ASME code case on leak path assessments. The meeting would probably be sometime around the middle of March. The purpose would be to provide some discussion of the methodology and preliminary results of our project so that industry would have a preview before moving ahead with a code case that may or may not be consistent with our findings. I expect it will be a fairly limited effort to prepare for the telecon and the telecon itself (maybe 6 hours each). I'll try to get Stephen to join the call on Thursday to provide more details. In any event, if you could support I would propose to provide urgent funding to cover that activity and provide a balance of funding to cover the NRR comments after I get a 189 spending plan. I will try to get a SOW modification to you guys by next week. Let me know if you have any questions before the meeting on Thursday. Thanks for your hard work.

Greg

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**From:** Hanson, Brady D [brady.hanson@pnnl.gov]  
**Sent:** Monday, February 13, 2012 1:08 PM  
**To:** Oberson, Greg  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D; Hass, Kay E; Bisping, Lori S; Hanson, Brady D  
**Subject:** RE: follow up on draft NUREG and contract status

Greg,

(b)(4)



I will be in limited email contact the next couple days, but I can respond in the evenings or we can talk on Thursday.

Thanks,

Brady

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**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Monday, February 13, 2012 9:44 AM  
**To:** Hanson, Brady D  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D  
**Subject:** RE: follow up on draft NUREG and contract status

Thursday should work. I recommend the same time.

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**From:** Hanson, Brady D [mailto:brady.hanson@pnnl.gov]  
**Sent:** Monday, February 13, 2012 12:40 PM  
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**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D  
**Subject:** RE: follow up on draft NUREG and contract status

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Can we do it on Thursday? I am on travel for DOE today through Wednesday.

I will have the cost estimate to you shortly.

Brady

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**Sent:** Monday, February 13, 2012 9:32 AM  
**To:** Hanson, Brady D  
**Cc:** MacFarlan, Paul J; Crawford, Susan L; Cinson, Anthony D  
**Subject:** follow up on draft NUREG and contract status

All,

I propose that we have a telecon on Wednesday the 15<sup>th</sup> to discuss the status of the revisions to the NUREG report and the needs to extend the contract through the NRR review period. I'm happy to discuss with all of you if there are questions or concerns or I could discuss with Brady if there's just the need for a relatively brief status report. How about 1 PM ET/10 AM PT? Hopefully shouldn't take more than 30 minutes or so. Let me know about your availability.

Thanks,  
Greg

Oberson, Greg

---

**From:** Hanson, Brady D [brady.hanson@pnrl.gov]  
**Sent:** Thursday, February 16, 2012 6:36 PM  
**To:** Oberson, Greg  
**Cc:** Hanson, Brady D; Cinson, Anthony D; Crawford, Susan L  
**Subject:** RE: N6783 SOW modifications

Greg,

The SOW looks good. I have sent that and my spreadsheet of monthly costs to Lori/her backup so we can have the 189 to you on Tuesday.

Thanks,

Brady

---

**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Thursday, February 16, 2012 1:26 PM  
**To:** Hanson, Brady D  
**Subject:** N6783 SOW modifications

(b)(4)

Oberson, Greg

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**From:** Hanson, Brady D [brady.hanson@pnnl.gov]  
**Sent:** Thursday, February 23, 2012 3:18 PM  
**To:** Oberson, Greg  
**Subject:** RE: N6783 SOW modifications

Greg,

Lori just submitted it to PNNL contracts. We have asked for it to be expedited.

Sorry for the delay. (b)(6) The other person I was working with wasn't getting what I was asking.

Sorry I couldn't see you today. The meeting with Doug Weaver took a lot longer than planned and my ride had to hurry to the airport.

Hopefully one of these days we will meet up.

Brady

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**From:** Oberson, Greg [Greg.Oberson@nrc.gov]  
**Sent:** Thursday, February 23, 2012 8:49 AM  
**To:** Bisping, Lori S  
**Cc:** Cinson, Anthony D; Crawford, Susan L; Hanson, Brady D  
**Subject:** RE: N6783 SOW modifications

I checked with our contracting folks and they haven't seen the 189 form that I need to extend the contract past Tuesday the 28th. If I don't get the 189 before then I'll need to do a no-cost extension to keep the contract open until the form comes in. Please let me know if I should anticipate the 189 or do a no-cost extension.

Thanks,  
Greg

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**From:** Hanson, Brady D [mailto:brady.hanson@pnnl.gov]  
**Sent:** Thursday, February 16, 2012 6:36 PM  
**To:** Oberson, Greg  
**Cc:** Hanson, Brady D; Cinson, Anthony D; Crawford, Susan L  
**Subject:** RE: N6783 SOW modifications

Greg,

The SOW looks good. I have sent that and my spreadsheet of monthly costs to Lori/her backup so we can have the 189 to you on Tuesday.

Thanks,

Brady

From: Oberson, Greg [mailto:[Greg.Oberson@nrc.gov](mailto:Greg.Oberson@nrc.gov)]

Sent: Thursday, February 16, 2012 1:26 PM

To: Hanson, Brady D

Subject: N6783 SOW modifications

(b)(4)

**Nazario, Tomy**

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**From:** Haag, Robert  
**Sent:** Thursday, February 23, 2012 12:22 PM  
**To:** Nazario, Tomy  
**Cc:** Freeman, Scott  
**Subject:** RE: Mockup for RPV Stud Hole Sleeving

Tomy,

Scott's branch is unable to observe the mock-up for the RPV sleeving. My recommendation for moving forward is that we try to get Dave Failla to inspect some of the sleeving activities. If he is unavailable, then we will get the resident staff to perform the inspection. Your thoughts?

---

**From:** Nazario, Tomy  
**Sent:** Thursday, January 26, 2012 12:34 PM  
**To:** Haag, Robert  
**Subject:** Mockup for RPV Stud Hole Sleeving

Bob,

The NRC has been notified that PCI/WEC will be performing a mock-up of the reactor pressure vessel (RPV) stud hole sleeving machining equipment and machining sequencing at their Lake Bluff, IL facility on March 16, 2012. The residents and the Regional Mechanical/Materials Branch have been closely following this activity to ensure that we fully understand not only the technical and engineering aspects of this remediation effort, but also observe the work as it is performed in the field.

Historically only three plants that we know of have sleeved RPV stud holes and those include Comanche Peak, DC Cook, and McGuire. Watts Bar Unit 2 has one stud hole that was sleeved during the manufacturing of the RPV flange and three additional holes that are scheduled to be sleeved in April. Therefore, this will be the only plant in the US that we are aware of to have a total of 4 sleeved RPV stud holes.

An NRC observation of this mock-up will be beneficial for the following reasons:

- This remediation effort is not routinely performed in the nuclear industry and this type of machining has not been performed since the 1990s.
- This would allow an NRC inspector(s) to become familiar with the machining equipment and the critical steps of the machining process. This machining equipment is custom made. No one in CCI or NRR currently has knowledge on this sleeving process.
- Once the PCI/WEC machinists are on-site, they get their work done efficiently and expediently, as observed with the machining of the stud hole threads. Therefore, during an NRC inspection, we may slow them down to gain knowledge of the process.
- The PCI/WEC machinists have time/schedule restraints and the NRC does not want to be the reason for delays.
- Observation of this mock-up would be considered part of the inspection preparation and planning
- It will allow the NRC to better determine what inspection specialization/assistance we may need before the work takes place.

I would recommend that the Regional Mechanical/Materials Branch (Scott Freeman's group) attend the mockup. Dave Failla has been very involved with reviewing the initial engineering evaluation and inspecting the machining of the RPV stud holes. We have also informed NRR of TVA's plans to sleeve the RPV stud holes last December. My only other recommendation would be that we ensure that the same individual that observes the mockup be the one to also be onsite when the sleeving takes place.

8/17

Please let me know if you have any questions.

Tomy

**Tomy A. Nazario**  
**Senior Resident Inspector**  
**U.S. Nuclear Regulatory Commission**

**Watts Bar Nuclear Plant**  
**1260 Nuclear Plant Rd.**  
**Spring City, TN 37831**

**Tel: (423) 365-9112**  
**Cell: (b)(6)**  
**Fax: (423) 365-9803**

**E-mail: [Tomy.Nazario@nrc.gov](mailto:Tomy.Nazario@nrc.gov)**  
**Website: [www.nrc.gov](http://www.nrc.gov)**



Office of Nuclear Regulatory Research

Properties of CRDM Welds

Brady Hanson  
(509) 375-5051

Period of Performance: May 3, 2010–July 31, 2012  
Reporting Period: March 2012

**OBJECTIVE**

The objective of this project is to conduct nondestructive ultrasonic testing (UT), and an assessment of the leak path on Nozzle 63 from the North Anna Unit-2 reactor pressure vessel head. The assessment of the leak path will be conducted using instrumentation equivalent to or better than that used by industry. The results of the nondestructive examination will be compared to a previous assessment. A destructive analysis will be conducted to allow a visual assessment of the leak path. To the extent possible, the destructive analysis will be conducted such that materials from the nozzle and the J-groove weld that will be retained for later testing.

---

**TECHNICAL PROGRESS**

Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE

Task 1 is complete.

Task 2: Perform Ultrasonic Measurements of the Leakage Path

Task 2 is complete.

Task 3: Perform Destructive Evaluation of Leakage Path

Task 3 is complete and the final invoice from B&W was received and processed.

Task 4: Write NUREG/CR

PNNL is awaiting comments on the DRAFT NUREG/CR from NRC. The comments are expected in June 2012.

PNNL completed a paper and presentation given at the SPIE Smart Structures/NDE meeting and had them approved by NRC. PNNL also received permission to present the work to the 9<sup>th</sup> International Conference on NDE in Relation to Structural Integrity for Nuclear and Pressurized Components' sponsored by EPRI.

Task 5: Waste Disposal and Cleanup

Task 5 is complete.



Task 6: Project Management and Meetings

The planned telecom with NRC, industry, and PNNL has been postponed and PNNL will await direction from NRC.

**MEETINGS AND TRIPS**

None.

**PROBLEM AREAS**

None.

**SCHEDULE OF MILESTONES AND DELIVERABLES**

Receive and address NRC comments	by July 2012
Submit final NUREG/CR report	by July 30, 2012
Project closeout	July 31, 2012

**PLANS FOR THE NEXT REPORTING PERIOD**

Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE

Complete.

Task 2: Perform Ultrasonic Measurements of the Leakage Path

Complete.

Task 3: Perform Destructive Evaluation of Leakage Path Nozzle 63 Optional Work

Complete.

Task 4: Write NUREG/CR

Await final comments from NRC.

Task 5: Waste Disposal and Cleanup

Complete.

Task 6: Project Management and Meetings

No meetings planned. Support NRC as necessary and await final comments on the report.

**FINANCIAL STATUS**

(b)(4)

**VARIANCE EXPLANATION**

None.

**EQUIPMENT**

None.

**QUALITY ASSURANCE**

The Quality Assurance requirements for this project are provided in the Laboratory's Standards Based Management System (SBMS). The SBMS allows for a graded QA approach to meet the requirements of individual projects. No specific Quality Assurance requirements have been specified by the NRC for this project.

(b)(4)

(b)(4)

Office of Nuclear Regulatory Research

Properties of CRDM Welds

Brady Hanson  
(509) 375-5051

Period of Performance: May 3, 2010–July 31, 2012  
Reporting Period: April 2012

**OBJECTIVE**

The objective of this project is to conduct nondestructive ultrasonic testing (UT), and an assessment of the leak path on Nozzle 63 from the North Anna Unit-2 reactor pressure vessel head. The assessment of the leak path will be conducted using instrumentation equivalent to or better than that used by industry. The results of the nondestructive examination will be compared to a previous assessment. A destructive analysis will be conducted to allow a visual assessment of the leak path. To the extent possible, the destructive analysis will be conducted such that materials from the nozzle and the J-groove weld that will be retained for later testing.

---

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PNNL worked on the paper and presentation to be given at the 9<sup>th</sup> International Conference on NDE in Relation to Structural Integrity for Nuclear and Pressurized Components' sponsored by EPRI.

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Task 5 is complete.

Task 6: Project Management and Meetings

The planned telecom with NRC, industry, and PNNL has been postponed and PNNL will await direction from NRC.

**MEETINGS AND TRIPS**

None.

**PROBLEM AREAS**

None.

**SCHEDULE OF MILESTONES AND DELIVERABLES**

Receive and address NRC comments	by July 2012
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Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE

Complete.

Task 2: Perform Ultrasonic Measurements of the Leakage Path

Complete.

Task 3: Perform Destructive Evaluation of Leakage Path Nozzle 63 Optional Work

Complete.

Task 4: Write NUREG/CR

Await final comments from NRC.

PNNL will send the draft paper and presentation to be given at the 9<sup>th</sup> International Conference on NDE to NRC (Greg Oberson) for review and comment prior to submission to the conference. Additionally, a NRC 390A form will be completed/signed and returned to Greg as requested.

Task 5: Waste Disposal and Cleanup

Complete.

Task 6: Project Management and Meetings

NRC will inform PNNL if and when support is needed for a meeting with EPRI to discuss the results of this project. Support NRC as necessary and await final comments on the report.

(b)(4)

VARIANCE EXPLANATION

None.

EQUIPMENT

None.

QUALITY ASSURANCE

The Quality Assurance requirements for this project are provided in the Laboratory's Standards Based Management System (SBMS). The SBMS allows for a graded QA approach to meet the requirements of individual projects. No specific Quality Assurance requirements have been specified by the NRC for this project.

(b)(4)



(b)(4)

Poehler, Jeffrey

24

**From:** Poehler, Jeffrey *mr*  
**Sent:** Thursday, April 05, 2012 5:41 PM  
**To:** Wiebe, Joel; Purtscher, Patrick; Widrevitz, Dan  
**Cc:** Rosenberg, Stacey; Mozafari, Brenda; Shaikh, Atif; McGhee, James  
**Subject:** RE: Quad Cities Unit 2 Instrument Line Repair Relief Request Information  
**Attachments:** image001.jpg

(b)(6)

here are possible questions for the call tomorrow:

Description of the event – circumstances of the leak.

What is the extent of condition and what actions did they take (e.g. inspections of similar nozzles) to establish?

Characterization of flaw that caused leak- Apparently they will be requesting relief from the requirement of IWB-3420 that they must characterize the flaw by NDE. Their basis will probably be the assumption of a worst-case flaw in the nozzle or J-groove weld and a flaw growth analysis. How do they know the flaw is only in the nozzle and J-groove weld now and not in the vessel steel?

Repair plan

- What are the original nozzle and weld materials?
- What are the repair weld and nozzle materials?
- What code case(s) – N-638-4 (Conditionally approved in Rev. 16 of RG 1.147)?
- Any deviations from approved Code Case?
- Meeting NRC conditions for use of Code Case?
- Joel mentioned a plate being involved, which would be different than the ANO example and other similar repairs I've seen.

Why do they need to use this alternative versus doing a repair that is fully compliant with ASME Section XI? (would require removing reactor vessel head and welding from inside?)

Is there any industry experience with similar nozzle leaks in BWRs with similar materials and configurations? (If it is an Alloy 600 nozzle with 82/182 weld, there is lots of experience in PWRs. not sure about BWRs) In other words, does the BWR experience support the assumption that the flaw causing the leak is confined to the Alloy 82/182 J-weld or Alloy 600 nozzle material?

Corrosion evaluation of low-alloy steel exposed to coolant/steam between remnant of old nozzle and new nozzle.

A couple other similar half-nozzle relief requests using N-638 I found:

ML053620021  
ML040060475

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

**From:** Wiebe, Joel *mr*  
**Sent:** Thursday, April 05, 2012 4:52 PM

**To:** Poehler, Jeffrey; Purtscher, Patrick; Widrevitz, Dan  
**Cc:** Rosenberg, Stacey; Mozafari, Brenda; Shaikh, Atif; McGhee, James  
**Subject:** Quad Cities Unit 2 Instrument Line Repair Relief Request Information

The licensee currently is using the below authorized relief as a precedent.

The current timeline is as follows:

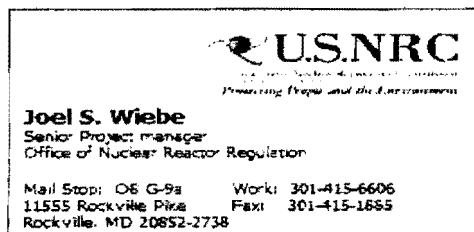
Tomorrow morning (time to be determined) there will be a teleconference at which the licensee will go over what they intend to submit. I am working at home tomorrow, so there will be a conference line and we will all call in. Since we won't have their submittal, we obviously will not be able to foresee all our questions, but if something obvious comes to mind, be sure and ask. You may want to have the below precedent in front of you.

The licensee intends to submit the relief request before c.o.b. tomorrow. The licensee will have firmer information tomorrow, but at this point they think they have about a weeks worth of prep work (procedures, procedure qualification, etc.) to do before they can do the repair. Based on that I think we may need to give verbal approval near the end of next week. In order to do that, everything we use must be on the docket and our review must be complete.

We will have a firmer timeline from the licensee tomorrow.

[View ADAMS P8 Properties ML103430156](#)

[Open ADAMS P8 Document \(Arkansas Nuclear One, Unit No. 1 - Relief Request ANO1-R&R-013, Proposed Alternative to Requirements Associated with Repair of Components, for Duration of ANO-1 Spring 2010 Refueling Outage 1R22 \(TAC ME3701\).\)](#)



**From:** Benson, Michael  
**To:** Stevens, Gary; Kirk, Mark; Rudland, David  
**Subject:** RE: J-R curve data (ferritic material focus)  
**Date:** Tuesday, April 10, 2012 8:34:00 AM

---

Get more funding, add 3 years to the App G schedule, and add vessels to xLPR. I want to make sure we're duplicating effort as much as possible.

**From:** Stevens, Gary  
**Sent:** Tuesday, April 10, 2012 8:32 AM  
**To:** Kirk, Mark; Rudland, David  
**Cc:** Benson, Michael  
**Subject:** RE: J-R curve data (ferritic material focus)

Then we have an addition to make to our Appendix G work, as originally instructed by WRC-175.

Get more funding and add another 3 years to the schedule.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
✉ [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
☎ 301-251-7569

**From:** Kirk, Mark  
**Sent:** Tuesday, April 10, 2012 8:30 AM  
**To:** Stevens, Gary; Rudland, David  
**Cc:** Benson, Michael  
**Subject:** Re: J-R curve data (ferritic material focus)

No

Piping has bigger cracks and so needs higher toughness.

Apparently even higher than it has (North Anna)



Nice try.

Mark Kirk, (b)(6) Cell (b)(6)

**From:** Stevens, Gary  
**To:** Kirk, Mark; Rudland, David  
**Cc:** Benson, Michael  
**Sent:** Tue Apr 10 07:52:56 2012  
**Subject:** RE: J-R curve data (ferritic material focus)

Is there easy proof in all of the available the crappy CVN data for piping that would prove RPV material is more limiting from a fracture point of view, thereby allowing us to dismiss all of those folks that have asked someone to demonstrate how RPV P-T curves bound the ferritic piping?

B/205

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
 [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
 301-251-7569

**From:** Kirk, Mark  
**Sent:** Monday, April 09, 2012 1:53 PM  
**To:** Rudland, David  
**Cc:** Stevens, Gary; Benson, Michael  
**Subject:** RE: J-R curve data (ferritic material focus)

Thanks for the info (about suckey CVN data).

You in the piping world are so blessed by high toughness materials (where CVN sucks and everything is limit load!). We in RPVs are not so encumbered. Our materials suck more, meaning CVN sucks less.

Best

mark

**From:** Rudland, David  
**Sent:** Monday, April 09, 2012 1:51 PM  
**To:** Kirk, Mark  
**Cc:** Stevens, Gary; Benson, Michael  
**Subject:** RE: J-R curve data (ferritic material focus)

Mark

I'm so not a fan of CVN-J relationships, especially for high toughness materials... I really think CVN becomes meaningless for really high toughness pipe.

Ok, now that I have stepped off my soapbox, here is some info that may be of some use.....

First of all, J-R round robins were done (Rahman, S., and others, "Summary of Results from the IPIRG-2 Round Robin Analyses," NUREGICR-6337, February 1996.) back in the IPIRG time frame. They did lots of good experiments.

The PIFRAC database is full of tensile and J-R curve data for a ton of nuclear grade piping materials... the database sits in database format, but Emc2 has a web-based copy here.... <http://www.emc-sq.com/MaterialDB/JRCurveData.php> . It's not all that user friendly, but everything is there. This database contains data from virtually all past NRC nuclear piping programs (Battelle, Argonne, MEA, and DTRC), EPRI-funded data by Westinghouse and GE, and data from Ontario Hydro. The problem here is that there is very little or no CVN data (since it sucks) for these materials.

The oil and gas industry still tries to use J-CVN relationships since much of their old pipe is only characterized by CVN. There has to be a database out there, so I've sent a few e-

mails to see if I get any nibbles. Will let you know

Thanks  
Dave

**From:** Kirk, Mark  
**Sent:** Monday, April 09, 2012 1:15 PM  
**To:** Rudland, David  
**Cc:** Stevens, Gary; Benson, Michael  
**Subject:** J-R curve data (ferritic material focus)

Dave --

We (Mike, Gary, and i) are embarking on an effort to put together a database of J-R curve data with the aim of updating the equations used to predict J-R curves of the kind that are now used in RG 1.161 (equivalent margins analysis for vessels with Charpy energy < 50 ft-lbs). I realize (of course) that piping and vessels are "different" ... but in the original work on the equations that are now in RG 1.161 piping data was used.

We are therefore wondering if you (and the Tsar of all things piping) might know of any existing data collections ... or data sources ... or citations ... that we should look to in our efforts. Or who we should contact (who will not charge us).

Thanks for the help,

mark

Mark Kirk  
Senior Materials Engineer  
NRC/RES/DE/CIB  
mark.kirk@nrc.gov

Poehler, Jeffrey

38

**From:** Poehler, Jeffrey *mpk*  
**Sent:** Monday, April 16, 2012 7:31 AM  
**To:** Wiebe, Joel  
**Subject:** RE: Quad Cities Unit 2 Relief Request Verbal Authorization Call With Licensee

Thanks Joel,

I agree with the proposed corrections- sorry about the errors.

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

---

**From:** Wiebe, Joel *mpk*  
**Sent:** Monday, April 16, 2012 7:14 AM  
**To:** Poehler, Jeffrey  
**Subject:** FW: Quad Cities Unit 2 Relief Request Verbal Authorization Call With Licensee

Jeff,

Thanks for your help over the weekend and putting together the script for the verbal. I intend to use this version of the script, with the corrections to change "pressurizer" to "reactor pressure vessel" and to correct the relief request number.

I intend to put the script into ADAMS by e-mail to document the phone call, without further review. Before I do that I will wait for your acknowledgement to give you the opportunity to make any additional corrections. LIC-102 gives us one to two days to document the phone call, so if you could get back to me today, I would appreciate it.

Joel

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**From:** Poehler, Jeffrey  
**Sent:** Sunday, April 15, 2012 11:29 AM  
**To:** Wiebe, Joel; Zimmerman, Jacob; Rosenberg, Stacey  
**Cc:** Sanchez Santiago, Elba; McGhee, James  
**Subject:** RE: Quad Cities Unit 2 Relief Request Verbal Authorization Call With Licensee

<< File: Quad Cities - Verbal Relief - Revised 4-15-12 - ME8347.docx >>

-----Original Appointment-----

**From:** Wiebe, Joel  
**Sent:** Sunday, April 15, 2012 6:10 AM  
**To:** Wiebe, Joel; Zimmerman, Jacob; Rosenberg, Stacey  
**Cc:** Sanchez Santiago, Elba; Poehler, Jeffrey; McGhee, James  
**Subject:** Quad Cities Unit 2 Relief Request Verbal Authorization Call With Licensee  
**When:** Sunday, April 15, 2012 10:30 AM-11:30 AM (GMT-05:00) Eastern Time (US & Canada).  
**Where:** Conference Call

When: Sunday, April 15, 2012 11:30 AM-12:30 PM (GMT-05:00) Eastern Time (US & Canada).  
Where: Conference Call

Note: The GMT offset above does not reflect daylight saving time adjustments.

\*~\*~\*~\*~\*~\*~\*~\*~\*~\*

800-689-9374, PassCode (b)(6)



Oberson, Greg

---

**From:** Oberson, Greg  
**Sent:** Monday, April 23, 2012 10:03 AM  
**To:** Collins, Jay  
**Cc:** Gavrilas, Mirela  
**Subject:** RE: discussion of NA nozzle 63

B/000

No problem.

---

**From:** Collins, Jay  
**Sent:** Monday, April 23, 2012 9:21 AM  
**To:** Oberson, Greg  
**Cc:** Gavrilas, Mirela  
**Subject:** RE: discussion of NA nozzle 63

Sounds like the best path forward at this point. Could you please set up a public meeting that meets folks schedules? My apologies to you and the PNNL staff.

Jay Collins

---

**From:** Oberson, Greg  
**Sent:** Monday, April 23, 2012 8:50 AM  
**To:** Collins, Jay; Gavrilas, Mirela  
**Subject:** FW: discussion of NA nozzle 63

I'm inclined to cancel the meeting. There is too much discussion on this already. I will pose to EPRI to make a public meeting sometime in the near future. Please let me know if you agree.

Greg

---

**From:** Kevin J Hacker [<mailto:kevin.j.hacker@dom.com>]  
**Sent:** Friday, April 20, 2012 7:16 PM  
**To:** Oberson, Greg; [rswain@epri.com](mailto:rswain@epri.com); [clatola@epri.com](mailto:clatola@epri.com)  
**Cc:** [rachel.doss@duke-energy.com](mailto:rachel.doss@duke-energy.com)  
**Subject:** RE: discussion of NA nozzle 63

I am in full agreement with Dan on this.

Kevin

-----Original Appointment-----

**From:** Dan.Nowakowski@fpl.com [mailto:Dan.Nowakowski@fpl.com] **On Behalf Of** Oberson, Greg

**Sent:** Friday, April 20, 2012 7:13 PM

**To:** rswain@epri.com; clatiola@epri.com

**Cc:** Kevin J Hacker (Generation - 6); rachel.doss@duke-energy.com

**Subject:** FW: discussion of NA nozzle 63

**When:** Tuesday, April 24, 2012 1:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).

**Where:**

Based upon the NRC request to exclude utilities. I suggest the call be cancelled!

If EPRI is going to discuss something that may impact licensees or MRP projects with the NRC, then utilities should also be involved in that discussion. It is important that licensees position on issues gets passed on to the NRC. With many head examinations coming up within the next 18 months, licensees have a vested interest in what is discussed as well as the potential effect on the MRP Inspection TAC head qualification program.

Dan

**From:** Oberson, Greg [Greg.Oberson@nrc.gov]

**Sent:** Thursday, April 19, 2012 4:58 PM

**Required:** Oberson, Greg; Nowakowski, Dan; rachel.doss@duke-energy.com; Wells, Tim G.; Rassler, Brian; Spanner, Jack; Grizzi, Robert; Collins, Jay

**Optional:** Lara, Pedro; Swain, Ronald; Kevin J Hacker

**Subject:** discussion of NA nozzle 63

**When:** Tuesday, April 24, 2012 1:00 PM-3:00 PM.

**Where:**

All,

My sincere apologies but NRC decided that the meeting participants should be limited to EPRI employees, and not utility employees at this time. We could have the option to follow up with a public meeting following the publication of the NUREG/CR report this summer. I appreciate your understanding and look forward to further dialogue in the future. Thanks.

~~~~~  
Please forward as necessary

Bridge line: 888-989-8137

Code: (b)(6)

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Oberson, Greg

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**Cc:** Gavrilas, Mirela  
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Greg

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**Sent:** Friday, April 20, 2012 7:16 PM  
**To:** Oberson, Greg; [rswain@epri.com](mailto:rswain@epri.com); [clatiola@epri.com](mailto:clatiola@epri.com)  
**Cc:** [rachel.doss@duke-energy.com](mailto:rachel.doss@duke-energy.com)  
**Subject:** RE: discussion of NA nozzle 63

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Kevin

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**Sent:** Friday, April 20, 2012 7:13 PM  
**To:** [rswain@epri.com](mailto:rswain@epri.com); [clatiola@epri.com](mailto:clatiola@epri.com)  
**Cc:** Kevin J Hacker (Generation - 6); [rachel.doss@duke-energy.com](mailto:rachel.doss@duke-energy.com)  
**Subject:** FW: discussion of NA nozzle 63  
**When:** Tuesday, April 24, 2012 1:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).  
**Where:**

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Dan

---

**From:** Oberson, Greg [Greg.Oberson@nrc.gov]

**Sent:** Thursday, April 19, 2012 4:58 PM

**Required:** Oberson, Greg; Nowakowski, Dan; [rachel.doss@duke-energy.com](mailto:rachel.doss@duke-energy.com); Wells, Tim G.; Ressler, Brian; Spanner, Jack; Grizzi, Robert; Collins, Jay

**Optional:** Lara, Pedro; Swain, Ronald; Kevin J Hacker

**Subject:** discussion of NA nozzle 63

**When:** Tuesday, April 24, 2012 1:00 PM-3:00 PM.

**Where:**

All,

My sincere apologies but NRC decided that the meeting participants should be limited to EPRI employees, and not utility employees at this time. We could have the option to follow up with a public meeting following the publication of the NUREG/CR report this summer. I appreciate your understanding and look forward to further dialogue in the future. Thanks.

---

Please forward as necessary

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Code: (b)(5)

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---

If you have received this electronic transmission in error, please reply immediately to the sender that you have received the message in error, and delete it. Thank you.

Oberson, Greg

---

**From:** Cinson, Anthony D [anthony.cinson@pnnl.gov]  
**Sent:** Monday, April 23, 2012 1:21 PM  
**To:** Oberson, Greg  
**Cc:** Crawford, Susan L; Hanson, Brady D  
**Subject:** Re: Canceled: EPRI telecon on Nozzle 63

Thanks Greg for letting us know. I'm working from home today, [REDACTED] Of course we will send you the paper and pres for the 9th. I send a draft paper to Susan last week for review and to put the finishing touches on it...should be coming to you shortly. So I might have great attendance at my talk huh? :-)

R1302

Sent via BlackBerry

---

**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Monday, April 23, 2012 08:14 AM  
**To:** Hanson, Brady D; Crawford, Susan L; Cinson, Anthony D; MacFarlan, Paul J  
**Subject:** Canceled: EPRI telecon on Nozzle 63

When: Tuesday, April 24, 2012 1:00 PM-3:00 PM (GMT-05:00) Eastern Time (US & Canada).

Note: The GMT offset above does not reflect daylight saving time adjustments.

\*\*\*\*\*

All,  
Sorry, but we decided that we can't do this as a non-public meeting so we'll have to cancel the telecon. There were a lot of back and forth discussions between NRC and EPRI that led to this decision. I made everyone aware of your upcoming presentation at the 9<sup>th</sup> NDE meeting. By the way, I'll need to see the final versions of the slides and paper for the 9<sup>th</sup> NDE. I don't think I've gotten them yet. I will need to put them on ADAMS, so please include the 390a forms.

Thanks,  
Greg

Oberson, Greg

---

**From:** Cinson, Anthony D [anthony.cinson@pnnl.gov]  
**Sent:** Thursday, April 26, 2012 11:02 AM  
**To:** Oberson, Greg  
**Subject:** RE: CRDM-9th EPRI NDE Conference

Sounds good...

---

**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Thursday, April 26, 2012 6:30 AM  
**To:** Cinson, Anthony D  
**Subject:** RE: CRDM-9th EPRI NDE Conference

b6

B1303

Thanks, (b)(6) I'll try to get response to you before then.

Greg

---

**From:** Cinson, Anthony D [mailto:anthony.cinson@pnnl.gov]  
**Sent:** Wednesday, April 25, 2012 4:07 PM  
**To:** Oberson, Greg  
**Subject:** CRDM-9th EPRI NDE Conference  
**Importance:** High

Hi Greg,

Please find the conference paper for the 9<sup>th</sup> EPRI NDE conference attached for your review. Once I receive and incorporate your comments/edits, I can send the paper through our information release process. This will trigger the signing of the 390A form to which I will send to you.

The presentation is still being modified. Will send to you when completed for review.

Thanks!  
Tony



Poehler, Jeffrey

From: Poehler, Jeffrey *NRK*  
Sent: Thursday, April 26, 2012 3:44 PM  
To: McLellan, Thomas; Sreenivas, V  
Subject: RE: missed exam

V, I concur with Tom's assessment.

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

-----Original Message-----  
From: McLellan, Thomas *NRK*  
Sent: Thursday, April 26, 2012 3:24 PM  
To: Sreenivas, V  
Cc: Poehler, Jeffrey  
Subject: RE: missed exam

From all my experience this is the right way to go and in the best interest in safety. Although this not a significant safety issue it's a matter dotting our I's and crossing our T's. I hate to see the licensee to get to about 100% power and someone questions it over something that's not a significant safety issue. It means we did not do our job. Stacey will be back Monday. I'll be home to about 11am tomorrow and you or Jeff can call me at

(b)(6) if there are any questions. Tom

-----Original Message-----  
From: Sreenivas, V *NRK*  
Sent: Thursday, April 26, 2012 3:05 PM  
To: McLellan, Thomas  
Subject: RE: missed exam

If it is verbal approval, we have time until Monday. This means approve by April 30th, 11.59 pm right!!

From: McLellan, Thomas  
Sent: Thursday, April 26, 2012 2:57 PM  
To: Poehler, Jeffrey; Sreenivas, V  
Subject: RE: missed exam

Jeff,

Under ASME Code, Section XI, Paragraph IWB-2412(b) the licensee can extend the 1st period by a year. It does not help them because the 1st period ends April 30, 2012 and it would only extend it to April 30, 2013. The next refueling outage is in the Fall of 2013 approx 6 months after 1st period extension ended. It's my recommendation to be legal the licensee needs submit a relief and we give them a verbal relief before they start-up. Tom

-----Original Message-----  
From: Sreenivas, V  
Sent: Thursday, April 26, 2012 11:31 AM  
To: McLellan, Thomas

Subject: FW: missed exam

From: Tom Shaub [tom.schaub@dom.com]  
Sent: Thursday, April 26, 2012 9:45 AM  
To: Sreenivas, V  
Subject: missed exam

*1 Dominion*

The examination of the reactor vessel interior (B-N-1) for the fourth interval was currently scheduled during the spring 2012 refueling outage but inadvertently missed during the refueling activities. North Anna Unit 1 is currently in the first period of the fourth inspection interval which will end on April 30, 2012 and therefore, is requesting exigent approval to defer the subject examination (Category B-N-1) until the fall 2013 refueling outage.

Dominion Resources Services, Inc.  
Thomas Shaub  
Technical Consultant  
Innsbrook Technical Center  
5000 Dominion Boulevard  
Glen Allen, VA 23060  
Phone: (804) 273-2763  
Fax: (804) 273-3715  
E-mail: [Tom.Schaub@dom.com](mailto:Tom.Schaub@dom.com)<<mailto:Tom.Schaub@dom.com>>

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**Cheruvenci, Ganesh**

47

**From:** Scarbrough, Thomas *RES*  
**Sent:** Monday, April 30, 2012 11:26 AM  
**To:** Cheruvenci, Ganesh  
**Subject:** RE: 5/1 Review of VY Steam Dryer Inspection Reports at local NEI/NPOC Rockville office

I will meet you at the GE office at 8:15 Tuesday.

Thanks.  
Tom

**From:** Cheruvenci, Ganesh *IN 12*  
**Sent:** Monday, April 30, 2012 11:04 AM  
**To:** Scarbrough, Thomas  
**Cc:** Sheng, Simon; Guzman, Richard  
**Subject:** FW: 5/1 Review of VY Steam Dryer Inspection Reports at local NEI/NPOC Rockville office

Tom—Simon and I are going to the GE office on 5/1 at 8.15 am. Please join us.

**From:** Guzman, Richard *IN 12*  
**Sent:** Friday, April 13, 2012 7:22 AM  
**To:** Scarbrough, Thomas; Cheruvenci, Ganesh; Sheng, Simon  
**Subject:** 5/1 Review of VY Steam Dryer Inspection Reports at local NEI/NPOC Rockville office

Gentlemen,

The NPOC office large conference room is reserved for the entire day of 5/1 for you to review the VY documents. The GE representative, Patricia Campbell, will meet you just after 0800 at the office (the external doors to the building are locked until 0800).

You will have privacy for review and discussion while Patricia uses an adjacent office area within the NPOC office. Patricia will be bringing each of you paper copies of the reports for your review. As for GEH and Entergy, others may be with Patricia or they can conference for questions either by phone or via webex, as needed.

Please let me know soonest if you'd prefer to set up a conference call/webex at the beginning or if you prefer to review the reports and then hold a conference call only if you have questions. Once you let me know, I can coordinate w/Patricia and make the appropriate arrangements in advance.

Below is a map showing the relative location of the NPOC office our building. The entrance to the office building connected to Chili's is behind Chili's and up a few steps or a ramp. Enter the double glass doors, proceed to the elevator just to the left of the foyer, or take the stairs behind the elevator. The NPOC office is on the second floor, just a bit further down the hallway in the same direction away from the elevator (i.e., to the right stepping directly out of the elevator and facing away from the elevator). The office door has "NEI" on the large glass and a keypad. Patricia will try to arrive in advance and be prepared to have the door open or will open it.

Patricia's cell phone number is (b)(6) in the event that you have any issues meeting her that morning. I will not be attending this activity, but will be available (301-415-1030) if you have any questions that day.

**Cheruvenci, Ganesh**

78

**From:** Guzman, Richard *RR*  
**Sent:** Monday, April 30, 2012 5:31 PM  
**To:** Cheruvenci, Ganesh; Scarbrough, Thomas  
**Cc:** Sheng, Simon  
**Subject:** RE: 5/1 Review of VY Steam Dryer Inspection Reports at local NEI/NPOC Rockville office

Tom, Ganesh, and Simon,

If possible, will you be able to bring with you a laptop computer in order to review files on a CD? The GEH contact just informed me today with that recommendation, as an additional backup/tool for reviewing the documents. If it's not doable at this point, I'm sure she will still have the ability to print copies out for you.

Rich

---

**From:** Cheruvenci, Ganesh *RR*  
**Sent:** Monday, April 30, 2012 11:03 AM  
**To:** Scarbrough, Thomas  
**Cc:** Sheng, Simon; Guzman, Richard  
**Subject:** FW: 5/1 Review of VY Steam Dryer Inspection Reports at local NEI/NPOC Rockville office

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**Sent:** Friday, April 13, 2012 7:22 AM  
**To:** Scarbrough, Thomas; Cheruvenci, Ganesh; Sheng, Simon  
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JCN-N6783

**Office of Nuclear Regulatory Research**

**Properties of CRDM Welds**

**Brady Hanson  
(509) 375-5051**

**Period of Performance: May 3, 2010–July 31, 2012**

**Reporting Period: May 2012**

**OBJECTIVE**

The objective of this project is to conduct nondestructive ultrasonic testing (UT), and an assessment of the leak path on Nozzle 63 from the North Anna Unit-2 reactor pressure vessel head. The assessment of the leak path will be conducted using instrumentation equivalent to or better than that used by industry. The results of the nondestructive examination will be compared to a previous assessment. A destructive analysis will be conducted to allow a visual assessment of the leak path. To the extent possible, the destructive analysis will be conducted such that materials from the nozzle and the J-groove weld that will be retained for later testing.

---

**TECHNICAL PROGRESS**

**Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE**

Task 1 is complete.

**Task 2: Perform Ultrasonic Measurements of the Leakage Path**

Task 2 is complete.

**Task 3: Perform Destructive Evaluation of Leakage Path**

Task 3 is complete.

**Task 4: Write NUREG/CR**

PNNL received comments on the DRAFT NUREG/CR from the NRC on May 16, 2012.

**Task 5: Waste Disposal and Cleanup**

Task 5 is complete.

**Task 6: Project Management and Meetings**

The planned telecom with NRC, industry, and PNNL has been postponed and PNNL will await direction from NRC.

**MEETINGS AND TRIPS**

The paper, "Comparison of an Ultrasonic Phased Array Evaluation with Destructive Analysis of a Documented Leak Path in a Nozzle Removed from Service," was presented at the 9<sup>th</sup> International Conference on Nondestructive Evaluation in Relation to Structural Integrity for Nuclear and Pressurized Components. The conference was held in Bellevue, Washington, May 21–24.

**PROBLEM AREAS**

None.

**SCHEDULE OF MILESTONES AND DELIVERABLES**

|                                  |                  |
|----------------------------------|------------------|
| Receive and address NRC comments | May 16, 2012     |
| Submit final NUREG/CR report     | by July 30, 2012 |
| Project closeout                 | July 31, 2012    |

**PLANS FOR THE NEXT REPORTING PERIOD**

**Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE**

Complete.

**Task 2: Perform Ultrasonic Measurements of the Leakage Path**

Complete.

**Task 3: Perform Destructive Evaluation of Leakage Path Nozzle 63 Optional Work**

Complete.

**Task 4: Write NUREG/CR**

Address comments on the DRAFT NUREG/CR.

**Task 5: Waste Disposal and Cleanup**

Complete.

**Task 6: Project Management and Meetings**

NRC will inform PNNL if and when support is needed for a meeting with EPRI to discuss the results of this project. Support NRC as necessary. Once the report is completed, the project will be closed out.

(b)(4)

**VARIANCE EXPLANATION**

None

**EQUIPMENT**

None.

**QUALITY ASSURANCE**

The Quality Assurance requirements for this project are provided in the Laboratory's Standards Based Management System (SBMS). The SBMS allows for a graded QA approach to meet the requirements of individual projects. No specific Quality Assurance requirements have been specified by the NRC for this project.

(b)(4)



(b)(4)

Oberson, Greg

---

**From:** Cinson, Anthony D [anthony.cinson@pnnl.gov]  
**Sent:** Tuesday, May 08, 2012 10:47 AM  
**To:** Oberson, Greg  
**Cc:** Crawford, Susan L; Hanson, Brady D  
**Subject:** Nozzle 63 discussions

Hi Greg,

I just found out that our NRC group here at the lab will be hosting some visitors from EPRI and industry on the 17<sup>th</sup> and 18<sup>th</sup> of next week. Jack Spanner from EPRI and Jack Lareau from WesDyne will be at PNNL to discuss a number of topics. One of the topics they wish to discuss is Nozzle 63. I had remembered your words from a few weeks ago when we had the telecom scheduled with EPRI and industry that you would help guide the discussions on the topic of Nozzle 63 so we don't give out 'free' information. If you have time on Thursday (May 10), Susan and I would like to discuss with you this topic.

Thanks!

Tony

---

**Anthony D. Cinson**

*Scientist/Engineer*

Applied Physics/National Security Directorate

Pacific Northwest National Laboratory

902 Battelle Boulevard

P.O. Box 999, MSIN KS-26

Richland, WA 99352 USA

Tel: 509-375-3913

Fax: 509-375-6497

BlackBerry (b)(6)

Mobile: (b)(6)

Email: [anthony.cinson@pnl.gov](mailto:anthony.cinson@pnl.gov)

[www.pnl.gov](http://www.pnl.gov) <<http://www.pnl.gov>>

Oberson, Greg

---

**From:** Cinson, Anthony D [anthony.cinson@pnnl.gov]  
**Sent:** Thursday, May 10, 2012 1:20 PM  
**To:** Oberson, Greg  
**Subject:** RE: Nozzle 63 discussions  
**Attachments:** 390A form\_PNNL-SA-87735.pdf

Hi Greg,

How does 11am PST which would be 2PM EST work for a quick discussion?

Also, attached you will find the 390A form for the 9<sup>th</sup> EPRI NDE conference manuscript on CRDM.

Thanks!

---

**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Wednesday, May 09, 2012 6:25 AM  
**To:** Cinson, Anthony D  
**Subject:** RE: Nozzle 63 discussions

That's fine, let me know when you'd like to discuss.

Greg

---

**From:** Cinson, Anthony D [mailto:anthony.cinson@pnnl.gov]  
**Sent:** Tuesday, May 08, 2012 10:47 AM  
**To:** Oberson, Greg  
**Cc:** Crawford, Susan L; Hanson, Brady D  
**Subject:** Nozzle 63 discussions

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Tony

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**Anthony D. Cinson**

*Scientist/Engineer*

Applied Physics/National Security Directorate

Pacific Northwest National Laboratory

902 Battelle Boulevard

P.O. Box 999, MSIN K5-26

Richland, WA 99352 USA

Tel: 509-375-3913

Fax: 509-375-6497

BlackBerry (b)(6)

Mobile: (b)(6)

Email: [anthony.cinson@pnl.gov](mailto:anthony.cinson@pnl.gov)

[www.pnl.gov](http://www.pnl.gov) <<http://www.pnl.gov>>

Oberson, Greg

---

**From:** Cinson, Anthony D [anthony.cinson@pnrl.gov]  
**Sent:** Thursday, May 10, 2012 2:11 PM  
**To:** Oberson, Greg  
**Subject:** Re: Nozzle 63 discussions

How about 3et? On call with carol nove

---

Sent via BlackBerry

---

**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Thursday, May 10, 2012 11:04 AM  
**To:** Cinson, Anthony D  
**Subject:** RE: Nozzle 63 discussions

Sorry I just saw this, can you call me in at about 2:15 ET (in 10 min)? Thanks.

---

**From:** Cinson, Anthony D [mailto:anthony.cinson@pnrl.gov]  
**Sent:** Thursday, May 10, 2012 1:20 PM  
**To:** Oberson, Greg  
**Subject:** RE: Nozzle 63 discussions

Hi Greg,

How does 11am PST which would be 2PM EST work for a quick discussion?

Also, attached you will find the 390A from for the 9<sup>th</sup> EPRI NDE conference manuscript on CRDM.

Thanks!

---

**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Wednesday, May 09, 2012 6:25 AM  
**To:** Cinson, Anthony D  
**Subject:** RE: Nozzle 63 discussions

That's fine, let me know when you'd like to discuss.

Greg

**From:** Cinson, Anthony D [<mailto:anthony.cinson@pnnl.gov>]  
**Sent:** Tuesday, May 08, 2012 10:47 AM  
**To:** Oberson, Greg  
**Cc:** Crawford, Susan L; Hanson, Brady D  
**Subject:** Nozzle 63 discussions

Hi Greg,

I just found out that our NRC group here at the lab will be hosting some visitors from EPRI and Industry on the 17<sup>th</sup> and 18<sup>th</sup> of next week. Jack Spanner from EPRI and Jack Lareau from WesDyne will be at PNNL to discuss a number of topics. One of the topics they wish to discuss is Nozzle 63. I had remembered your words from a few weeks ago when we had the telecom scheduled with EPRI and industry that you would help guide the discussions on the topic of Nozzle 63 so we don't give out 'free' information. If you have time on Thursday (May 10), Susan and I would like to discuss with you this topic.

Thanks!

Tony

---

**Anthony D. Cinson**  
*Scientist/Engineer*  
Applied Physics/National Security Directorate

Pacific Northwest National Laboratory  
902 Battelle Boulevard  
P.O. Box 999, MSIN K5-26  
Richland, WA 99352 USA

Tel: 509-375-3913

Fax: 509-375-6497

BlackBerry: (b)(6)

Mobile: (b)(6)

Email: [anthony.cinson@pnl.gov](mailto:anthony.cinson@pnl.gov)

[www.pnl.gov](http://www.pnl.gov) <<http://www.pnl.gov>>

Oberson, Greg

---

**From:** Cinson, Anthony D [anthony.cinson@pnrl.gov]  
**Sent:** Thursday, May 10, 2012 3:33 PM  
**To:** Oberson, Greg  
**Subject:** Re: Nozzle 63 discussions

Thanks Greg, I'm still on with Carol;-)

-----  
Sent via BlackBerry

**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Thursday, May 10, 2012 12:25 PM  
**To:** Cinson, Anthony D  
**Subject:** RE: Nozzle 63 discussions

Tony,

Sorry I have to step away from my computer for a bit. The only real guidance I have for your meeting with the industry folks is this: You're free to share/discuss anything pertaining to the Nozzle 63 work, lessons learned, good practices, etc. Please do not say anything implying that NRC has drawn conclusions from this work that will affect regulatory decision making, interpretation of code cases, etc. If they ask you for recommendations or thoughts on any research they are doing such as mockups, you can speak for yourself as a technical expert, but do not imply that you are expressing an NRC opinion. NRC expects that the industry will provide appropriate independent technical justification for any work they do. I recommend that you send an email to Jack and Jack stating these conditions, I'll follow up with an email that you can forward them stating this is the guidance you have from the NRC.

Also, thanks for sending the 390a form. I will need the final version of the paper to include in ADAMS.

Let me know if there's anything else you'd like to discuss.

Greg

-----  
**From:** Cinson, Anthony D [mailto:anthony.cinson@pnrl.gov]  
**Sent:** Thursday, May 10, 2012 2:11 PM  
**To:** Oberson, Greg  
**Subject:** Re: Nozzle 63 discussions

How about 3et? On call with carol nove

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Sent via BlackBerry

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**From:** Oberson, Greg [<mailto:Greg.Oberson@nrc.gov>]  
**Sent:** Thursday, May 10, 2012 11:04 AM  
**To:** Cinson, Anthony D  
**Subject:** RE: Nozzle 63 discussions

Sorry I just saw this, can you call me in at about 2:15 ET (in 10 min)? Thanks.

---

**From:** Cinson, Anthony D [<mailto:anthony.cinson@pnrl.gov>]  
**Sent:** Thursday, May 10, 2012 1:20 PM  
**To:** Oberson, Greg  
**Subject:** RE: Nozzle 63 discussions

Hi Greg,

How does 11am PST which would be 2PM EST work for a quick discussion?

Also, attached you will find the 390A from for the 9<sup>th</sup> EPRI NDE conference manuscript on CRDM.

Thanks!

---

**From:** Oberson, Greg [<mailto:Greg.Oberson@nrc.gov>]  
**Sent:** Wednesday, May 09, 2012 6:25 AM  
**To:** Cinson, Anthony D  
**Subject:** RE: Nozzle 63 discussions

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Greg

---

**From:** Cinson, Anthony D [<mailto:anthony.cinson@pnrl.gov>]  
**Sent:** Tuesday, May 08, 2012 10:47 AM  
**To:** Oberson, Greg  
**Cc:** Crawford, Susan L; Hanson, Brady D  
**Subject:** Nozzle 63 discussions

Hi Greg,



I just found out that our NRC group here at the lab will be hosting some visitors from EPRI and Industry on the 17<sup>th</sup> and 18<sup>th</sup> of next week. Jack Spanner from EPRI and Jack Lareau from WesDyne will be at PNNL to discuss a number of topics. One of the topics they wish to discuss is Nozzle 63. I had remembered your words from a few weeks ago when we had the telecom scheduled with EPRI and industry that you would help guide the discussions on the topic of Nozzle 63 so we don't give out 'free' information. If you have time on Thursday (May 10), Susan and I would like to discuss with you this topic.

Thanks!

Tony

---

**Anthony D. Cinson**

*Scientist/Engineer*

Applied Physics/National Security Directorate

Pacific Northwest National Laboratory

902 Battelle Boulevard

P.O. Box 999, MSIN K5-26

Richland, WA 99352 USA

Tel: 509-375-3913

Fax: 509-375-6497

BlackBerry (b)(6)

Mobile (b)(6)

Email: [anthony.cinson@pnl.gov](mailto:anthony.cinson@pnl.gov)

[www.pnl.gov](http://www.pnl.gov) <<http://www.pnl.gov>>

Oberson, Greg

---

**From:** Cinson, Anthony D [collaboration@pnnl.gov]  
**Sent:** Friday, May 11, 2012 1:28 PM  
**To:** Oberson, Greg  
**Subject:** anthony.cinson@pnnl.gov is requesting files from you

Hello [Greg.Oberson@nrc.gov](mailto:Greg.Oberson@nrc.gov).

Cinson, Anthony D ([anthony.cinson@pnnl.gov](mailto:anthony.cinson@pnnl.gov)) has requested you to send them files using Mass Transit, a web-based file transfer service:

Subject: NUREG/CR comments

Comments: Greg,  
This should work for you.

Thanks,  
Tony

To send the files, go to:

(b)(7)(F)

NOTE: This link is good for only 336 hours.

This message was automatically generated from the PNNL FX Web File Transfer Service. If you have questions about its validity, please contact the sender listed above.

B/123

Oberson, Greg

---

**From:** Cinson, Anthony D [collaboration@pnnl.gov]  
**Sent:** Friday, May 11, 2012 1:31 PM  
**To:** Oberson, Greg  
**Subject:** You have files ready for pickup

Hello,

Cinson, Anthony D ([anthony.cinson@pnnl.gov](mailto:anthony.cinson@pnnl.gov)) has sent you the following 1 file(s.)

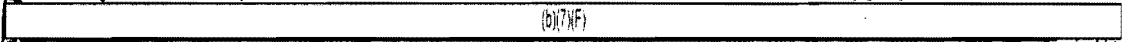
Subject: 9th EPRI conferece

Comments: Hi Greg,

You should be able to download the final version of the manuscript on CRDM.

Thanks,  
Tony

The following files have been uploaded to the MassTransit Web File Transfer Services. You can download them by going to:

 (b)(7)(NF)

and selecting the file(s) and clicking Download (All/Selected).

NOTE: This link and contained passkey are only good for 14 days.

CRDM\_9th\_NDE\_Conference\_Bellevue\_Final.docx (3.89M bytes)

This message was automatically generated from the PNNL FX Web File Transfer Service. If you have questions about its validity, please contact the sender listed above.

4/21/12

Oberson, Greg

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**From:** Cinson, Anthony D [collaboration@pnnl.gov]  
**Sent:** Wednesday, May 16, 2012 7:06 PM  
**To:** Oberson, Greg  
**Subject:** You have files ready for pickup

Hello,

Cinson, Anthony D ([anthony.cinson@pnnl.gov](mailto:anthony.cinson@pnnl.gov)) has sent you the following 1 file(s):

Subject: CRDM Presentation

Comments: Hi Greg,

Please find the EPRI presentation for your review.

Also, I've received the commented NUREG/CR. Will look into addressing your comments as soon as possible.

Thanks!

Tony

The following files have been uploaded to the MassTransit Web File Transfer Services. You can download them by going to:

(b)(7)(F)

and selecting the file(s) and clicking Download (All/Selected).

NOTE: This link and contained passkey are only good for 14 days.

CRDM\_ADC\_9th EPRI\_2012\_v002.pptx (14.23M bytes)

This message was automatically generated from the PNNL FX Web File Transfer Service. If you have questions about its validity, please contact the sender listed above.

Office of Nuclear Regulatory Research  
Properties of CRDM Welds

Brady Hanson  
(509) 375-5051

Period of Performance: May 3, 2010–July 31, 2012  
Reporting Period: June 2012

**OBJECTIVE**

The objective of this project is to conduct nondestructive ultrasonic testing (UT), and an assessment of the leak path on Nozzle 63 from the North Anna Unit-2 reactor pressure vessel head. The assessment of the leak path will be conducted using instrumentation equivalent to or better than that used by industry. The results of the nondestructive examination will be compared to a previous assessment. A destructive analysis will be conducted to allow a visual assessment of the leak path. To the extent possible, the destructive analysis will be conducted such that materials from the nozzle and the J-groove weld that will be retained for later testing.

---

**TECHNICAL PROGRESS**

Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE

Task 1 is complete.

Task 2: Perform Ultrasonic Measurements of the Leakage Path

Task 2 is complete.

Task 3: Perform Destructive Evaluation of Leakage Path

Task 3 is complete.

Task 4: Write NUREG/CR

PNNL addressed the NRC comments on the draft report and submitted the revised version to NRC on June 19. NRC management performed their review and approved the NUREG/CR with minor changes and sent those changes to PNNL on June 29.

Task 5: Waste Disposal and Cleanup

Task 5 is complete.

Task 6: Project Management and Meetings

A telecom was held with NRC to discuss the review comments on the draft NUREG/CR.

**MEETINGS AND TRIPS**

None.

**PROBLEM AREAS**

None.

**SCHEDULE OF MILESTONES AND DELIVERABLES**

Submit final NUREG/CR report by July 30, 2012

Project closeout July 31, 2012

**PLANS FOR THE NEXT REPORTING PERIOD**

**Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE**

Complete.

**Task 2: Perform Ultrasonic Measurements of the Leakage Path**

Complete.

**Task 3: Perform Destructive Evaluation of Leakage Path Nozzle 63 Optional Work**

Complete.

**Task 4: Write NUREG/CR**

The NUREG/CR final version will be prepared and made "camera ready" and issued to NRC after undergoing an internal PNNL review and receiving the PNNL publication number.

**Task 5: Waste Disposal and Cleanup**

Complete.

**Task 6: Project Management and Meetings**

Project records will be sent to the PNNL records center for storage and the project will be closed out by the end of July.

(b)(4)

**VARIANCE EXPLANATION**

None

**EQUIPMENT**

None.

**QUALITY ASSURANCE**

The Quality Assurance requirements for this project are provided in the Laboratory's Standards Based Management System (SBMS). The SBMS allows for a graded QA approach to meet the requirements of individual projects. No specific Quality Assurance requirements have been specified by the NRC for this project.

(b)(4)



(b)(4)

Oberson, Greg

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**From:** Cinson, Anthony D [anthony.cinson@pnl.gov]  
**Sent:** Thursday, June 14, 2012 2:46 PM  
**To:** Oberson, Greg  
**Cc:** Hanson, Brady D; Crawford, Susan L  
**Subject:** CRDM Presentation

Hi Greg,

I've received a request from Jack Lareau for a copy of my presentation that I gave at the 9<sup>th</sup> EPRI NDE conference last month in Seattle... I don't think you have any objections, but just wanted to inform you that I will send him a copy...

Thanks!

Tony

---

**Anthony D. Cinson**  
*Scientist/Engineer*  
Applied Physics/National Security Directorate

Pacific Northwest National Laboratory  
902 Battelle Boulevard  
P.O. Box 999, MSIN K5-26  
Richland, WA 99352 USA  
Tel: 509-375-3913  
Fax: 509-375-6497

(b)(6)

Email: [anthony.cinson@pnl.gov](mailto:anthony.cinson@pnl.gov)  
[www.pnl.gov](http://www.pnl.gov) <<http://www.pnl.gov>>

Oberson, Greg

---

From: Crawford, Susan L [collaboration@pnnl.gov]  
Sent: Tuesday, June 19, 2012 2:29 PM  
To: Oberson, Greg  
Subject: You have files ready for pickup

Hello,

Crawford, Susan L (Susan.Crawford@pnnl.gov) has sent you the following 1 file(s):

Subject: Files are available

Comments: Greg,

Here is the CRDM NUREG/CR. Please let us know if you have comments or questions.

Thanks,  
Susan

The following files have been uploaded to the MassTransit Web File Transfer Services. You can download them by going to:

(b)(7)(F)

and selecting the file(s) and clicking Download (All/Selected).

NOTE: This link and contained passkey are only good for 14 days.

NUREG-Nozzle-63\_061912.docx (27.89M bytes)

This message was automatically generated from the PNNL FX Web File Transfer Service. If you have questions about its validity, please contact the sender listed above.

B/139

**From:** Benson, Michael  
**To:** Rathbun, Howard  
**Cc:** Stevens, Gary  
**Subject:** ORNL Models  
**Date:** Wednesday, June 27, 2012 3:02:00 PM

---

Howard,

See [REDACTED] (b)(7)(F) there should be both axisymmetric and 3D vessel models there. They did a lot of investigation on the validity of simplified K equations for nozzle corner cracks.

Thanks,

**Michael Benson, PhD**  
U.S. Nuclear Regulatory Commission  
Materials Engineer - RES/DE/CIB  
Phone: (301) 251-7492  
Email: Michael.Benson@nrc.gov  
Office: CSB 5A10  
Mail Stop: CSB 5A24m

B199

Office of Nuclear Regulatory Research

Properties of CRDM Welds

Brady Hanson  
(509) 375-5051

Period of Performance: May 3, 2010–July 31, 2012  
Reporting Period: July 2012

**OBJECTIVE**

The objective of this project is to conduct nondestructive ultrasonic testing (UT), and an assessment of the leak path on Nozzle 63 from the North Anna Unit-2 reactor pressure vessel head. The assessment of the leak path will be conducted using instrumentation equivalent to or better than that used by industry. The results of the nondestructive examination will be compared to a previous assessment. A destructive analysis will be conducted to allow a visual assessment of the leak path. To the extent possible, the destructive analysis will be conducted such that materials from the nozzle and the J-groove weld that will be retained for later testing.

---

**TECHNICAL PROGRESS**

Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE

Task 1 is complete.

Task 2: Perform Ultrasonic Measurements of the Leakage Path

Task 2 is complete.

Task 3: Perform Destructive Evaluation of Leakage Path

Task 3 is complete.

Task 4: Write NUREG/CR

Final comments from NRC were received and addressed. The NUREG/CR was approved by NRC management and PNNL internal reviewers. The final, camera ready document was sent to NRC on July 19 as NUREG/CR-7142 and PNNL-21547. This activity is now complete.

Task 5: Waste Disposal and Cleanup

Task 5 is complete.

Task 6: Project Management and Meetings

All project records have been transferred to the PNNL records center. The project is being closed out by the end of July. Per an email from Greg Oberson, a camera, the scanner, and the

**JCN-N6783**

probe will be transferred from NRC to DOE Accountable property so that PNNL can retain the equipment and use for future projects as opposed to having to dispose of them. This activity is now complete.

**MEETINGS AND TRIPS**

None.

**PROBLEM AREAS**

None.

**SCHEDULE OF MILESTONES AND DELIVERABLES**

|                              |               |
|------------------------------|---------------|
| Submit final NUREG/CR report | July 20, 2012 |
| Project closeout             | July 31, 2012 |

**PLANS FOR THE NEXT REPORTING PERIOD**

**Task 1: Decontaminate the Nozzle and Prepare Laboratory for NDE**

Complete.

**Task 2: Perform Ultrasonic Measurements of the Leakage Path**

Complete.

**Task 3: Perform Destructive Evaluation of Leakage Path Nozzle 63 Optional Work**

Complete.

**Task 4: Write NUREG/CR**

Complete.

**Task 5: Waste Disposal and Cleanup**

Complete.

**Task 6: Project Management and Meetings**

Complete.

(b)(4)

**VARIANCE EXPLANATION**

None

**EQUIPMENT**

The camera, scanner, and probe are to be transferred from NRC property to DOE Accountable property so that they do not need to be disposed of.

**QUALITY ASSURANCE**

The Quality Assurance requirements for this project are provided in the Laboratory's Standards Based Management System (SBMS). The SBMS allows for a graded QA approach to meet the requirements of individual projects. No specific Quality Assurance requirements have been specified by the NRC for this project.

(b)(4)



(b)(4)

Oberson, Greg

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**From:** Hanson, Brady D [brady.hanson@pnnl.gov]  
**Sent:** Thursday, July 05, 2012 3:21 PM  
**To:** Oberson, Greg; Cinson, Anthony D; Crawford, Susan L; MacFarlan, Paul J  
**Cc:** Unwin, Stephen; Hass, Kay E; Hanson, Brady D  
**Subject:** RE: finalizing NUREG/CR

Greg,

You are right, just about everyone is out this week because of the July 4 holiday. But I want to assure you that PNNL has no intention of even coming close to the July 31 end date.

Kay is working on finalizing the document, I will ask Tony and Susan to do one more read through and it needs to have an independent internal review to meet PNNL requirements, but they have already started that.

I have asked that the document be ready to ship to you no later than July 20. We also plan on doing the project close out that week- one so that we have some cushion of a week or so if need be, but also because I am out of the office next week (b)(6) and then again the week of July 23.

I will keep you informed.

Thanks,

Brady

---

**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Thursday, July 05, 2012 11:49 AM  
**To:** Cinson, Anthony D; Crawford, Susan L; MacFarlan, Paul J; Hanson, Brady D  
**Cc:** Unwin, Stephen  
**Subject:** RE: finalizing NUREG/CR

All,  
I haven't heard a response to this, I suspect people may be out of the office on travel. However, I don't want to run into a time crunch with the period of performance of this contract ending July 31. I don't want to have to extend so your prompt attention would be much appreciated.

Thanks,  
Greg

Oberson, Greg

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**From:** Crawford, Susan L [Susan.Crawford@pnml.gov]  
**Sent:** Tuesday, July 10, 2012 1:12 PM  
**To:** Oberson, Greg  
**Subject:** RE: review journal article-----

06/30/12

Greg,

I'm back in the office and will be working on the NUREG and reviewing the journal article.

(b)(6)

Regards,

Susan

---

**From:** Oberson, Greg [mailto:Greg.Oberson@nrc.gov]  
**Sent:** Monday, July 09, 2012 1:51 PM  
**To:** Crawford, Susan L; Cinson, Anthony D; MacFarlan, Paul J; Hanson, Brady D  
**Subject:** review journal article-----

All,

As I mentioned several months ago, because of the good quality of this study, I'd like to publish the findings in an archival peer-reviewed journal. I drafted the attached article for Journal of Nuclear Materials and I'd like to submit for review. Please take a look and provide comments or input at your convenience, preferably within about 2 weeks. If you can do that I will aim to submit the article by the end of the month.

Thanks,  
Greg

Lupold, Timothy

**From:** Hardies, Robert *NRR*  
**Sent:** Wednesday, July 25, 2012 4:37 PM  
**To:** Lupold, Timothy; Hopkins, Jon  
**Cc:** Gonzalez, Hipolito; Sheng, Simon; Fairbanks, Carolyn  
**Subject:** RE: REQUEST: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

Carolyn and I sent the original email. Please coordinate with us.

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301.415-5802

Cell (b)(6)

**From:** Lupold, Timothy *NRR*  
**Sent:** Wednesday, July 25, 2012 1:51 PM  
**To:** Hopkins, Jon  
**Cc:** Gonzalez, Hipolito; Sheng, Simon; Fairbanks, Carolyn; Hardies, Robert  
**Subject:** RE: REQUEST: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

Jon, I will forward this to EVIB. They are responsible for Rx Vessels. The branch chief for EVIB is currently Stacey Rosenberg, but she is on leave for at least another week. Simon Sheng is her alternate today, and Carolyn Fairbanks, I believe will be her alternate next week.

Simon or Carolyn, please provide support to Jon. Also, coordinate with Bob Hardies on responses.

**From:** Hopkins, Jon *NRR*  
**Sent:** Wednesday, July 25, 2012 1:46 PM  
**To:** Gonzalez, Hipolito; Lupold, Timothy  
**Cc:** Fairbanks, Carolyn; Hardies, Robert; Roquecruz, Carla; Collins, Jay; Regan, Christopher; Rodriguez, Veronica; Astwood, Heather; McGinty, Tim; Muessle, Mary; Bahadur, Sher; Hiland, Patrick; Cheok, Michael; Chernoff, Harold; Lubinski, John; Nieh, Ho; Franovich, Rani; Berrios, Ilka  
**Subject:** REQUEST: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP  
**Importance:** High

Hipolito and Tim,

Belgium has directly contacted NRR staff with some questions because RPV NDE inspection have shown some indications on the Doel 3 NPP RPV (below thread).  
The issue may have generic implications including U.S. plants.

Can you have staff develop responses to the questions in a relatively short time? And/or would you rather have a phone call to discuss? Let me know.

I will be the liaison with Belgium and in coordination with OIP will contact/inform them of what information/assistance that we can provide them.

All effort should be charged to TAC ME3707.

Thank you,  
Jon Hopkins  
Senior Project Manager for International Activities  
NRR/DIRS

**From:** Hardies, Robert  
**Sent:** Wednesday, July 25, 2012 11:24 AM  
**To:** Fehst, Geraldine  
**Cc:** Fairbanks, Carolyn; Collins, Jay; Kirk, Mark  
**Subject:** FW: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

Gerry, I received this email and am unsure of the protocol. So I've forwarded it to you. I have not met the gentleman, and do not know his organization. At least one NRC addressee has provided a response. We would be happy to coordinate a response but want to make sure IP is in the loop. We can talk next week or, if you would like to talk sooner, Carolyn Fairbanks is the person to call...x6719. I will be travelling the rest of this week.

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

**From:** Briegleb Pierre [mailto:pierre.briegleb@belv.be]  
**Sent:** Wednesday, July 25, 2012 3:40 AM  
**To:** Sebastien.CROMBEZ@asn.fr; CRESPO BRAVO JULIO; Hardies, Robert; Collins, Jay; Kirk, Mark; petteri.tippiana@stuk.fi; dietmar.Kalkhof@ensi.ch; kees.desbouvrie@minvrom.nl  
**Cc:** De Boeck Benoit; Barras Pierre; Hoebeeck Simon; Fonkwa Christelle; Deledicque Vincent; SCHRAUBEN Manfred; WERTELAERS An; VAN WONTERGHEM Frederik; TOMBUYES Beatrice; aweyn@vincotte.be  
**Subject:** Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

Dear Sirs,

We are now facing in Belgium a potential problem on the reactor pressure vessel (RPV) of the Doel 3 NPP. Non-destructive examination revealed a lot of "indications" that need to be confirmed by another inspection technique (ongoing).

We would like to have your feedback, experience and advice regarding this potential problem. You will find hereunder a more comprehensive background and some questions we would like to answer.

Best regards,

Pierre Briegleb  
National Project Coordinator  
Bel V – Subsidiary of the Federal Agency for Nuclear Control (Belgium)

### Potential problem on the reactor pressure vessel

Belgian pressure vessels are inspected according to ASME XI. Volumetric inspections of the beltline zone are normally limited to the circumferential welds and surrounding heat affected zone and base material, within the limits settled by the code.

Additionally, as a result of the experience at Tricastin, inspections aiming at detecting possible underclad defects in the pressure vessel beltline region are planned for all Belgian plants. The first inspection of this kind took place at Doel 3 this summer.

These inspections are performed with a qualified method and encompass the whole height of the vessel beltline region. This means that we inspect clad base material in zones where no volumetric in-service inspection was performed up to now.

At Doel 3, according to the Owner, no underclad defects were detected.

Nevertheless, lot of defect indications of an apparently different type were detected by this UT-inspection aiming at detecting underclad defects, especially in one of the three forged rings (SA-508-cl.3). These indications appear to be laminar flaws, more or less parallel to the inner/outer surface of the pressure vessel, located in- and outside the inspected zone where underclad defects were looked at. Obviously, it is not possible to justify those indications on a one-by-one basis by means of an analytical evaluation according to the App. A of ASME XI code requirements.

The inspection method which revealed the presence of those defects has been qualified for detecting underclad defect.

An inspection of the whole height with the qualified method used to control the beltline welds started on the 16<sup>th</sup> of July; the results should not be available before begin of August. Similar inspections will be performed at Tihange 2 during the month of August.

In the absence of any other explanation at this stage, the Owner supposes to be in presence of fabrication defects.

The Doel 3 and Tihange 2 RPVs were forged by Rotterdam Dockyards (RDM), which according to the Owner provided some 24 vessels in Europe and the US. NUREG 1511 – Suppl. 2, p. 7-3, identifies 8 US units with RDM forged rings. Other European countries possibly concerned are Spain, Switzerland, the Netherlands (Borssele, Dodewaard), and probably others, not identified by Bel V at this stage.

Some questions:

1. Are there in your country RPVs (forged rings) fabricated by Rotterdam Dockyards (RDM)?
2. Is there any known concern with respect to fabrication defects in those rings?
3. Did you perform volumetric inspections in the beltline region which could have detected laminar defects in the beltline base material (a) during fabrication (b) in-service? If the answer is yes, describe which inspection (type, extent, frequency) and the corresponding results.
4. Do you perform inspections aiming at detecting underclad defects? If so, describe which inspection (type, extent, frequency) and the corresponding results.



3

**Poehler, Jeffrey**

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**From:** Hardies, Robert *mr*  
**Sent:** Thursday, August 02, 2012 12:06 PM  
**To:** Hiland, Patrick  
**Cc:** Fairbanks, Carolyn; Poehler, Jeffrey; Cheok, Michael  
**Subject:** RE: INFO: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

I think it would typically be the CVIB branch chief or me. I can take this.

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

**From:** Hiland, Patrick *mr*  
**Sent:** Thursday, August 02, 2012 10:29 AM  
**To:** Hardies, Robert  
**Cc:** Fairbanks, Carolyn; Poehler, Jeffrey; Cheok, Michael  
**Subject:** RE: INFO: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP  
**Importance:** High

Bob, who would have lead for follow-up on an issue like this? I believe we will find money to attend meeting if invited. 10,000 indications?

**From:** Hopkins, Jon *mr*  
**Sent:** Thursday, August 02, 2012 9:32 AM  
**To:** Hardies, Robert; Fairbanks, Carolyn  
**Cc:** Regan, Christopher; Rodriguez, Veronica; Astwood, Heather; Chernoff, Harold; Hiland, Patrick; Cheok, Michael; McGinty, Tim; Muessle, Mary; Bahadur, Sher; Roquecruz, Carla; Fehst, Geraldine; Tehrani, Navid  
**Subject:** INFO: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP  
**Importance:** High

Bob & Carolyn,

Attached is additional information from Belgium on the RPV UT inspection indications (10,000 indications) that they have found at Doel 3 NPP.

Belgium called me before they sent this information. They informed me that FANC (the Belgium Nuclear Regulator) will have a meeting on this topic with the licensee this month and will likely invite the NRC to attend. Likely that the meeting will be the week of August 13. NRR International travel money is tight, but consider if invited could we (should we) send someone and we will look at can we afford it.

Charge all time on this to TAC ME3707.

Jon



**From:** Briegleb Pierre [mailto:pierre.briegleb@belv.be]  
**Sent:** Thursday, August 02, 2012 9:13 AM  
**To:** Hopkins, Jon  
**Subject:** RE: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

Dear Jon,

As proposed during our phone call of today, I sent you an update of the status regarding the flaw indications of the Doel 3 NPP.

Thank you for your attention ,  
Best regards,

Pierre Briegleb  
National Project Coordinator  
Bel V – Subsidiary of the Federal Agency for Nuclear Control (Belgium)

**From:** Hopkins, Jon [mailto:Jon.Hopkins@nrc.gov]  
**Sent:** jeudi 26 juillet 2012 20:48  
**To:** Briegleb Pierre  
**Cc:** Fehst, Geraldine  
**Subject:** RE: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

Pierre,

Greetings. I am the liaison for Belgium in the Office of Nuclear Reactor Regulation, USNRC, and Ms. Fehst is our Office of International Programs contact for Belgium.

NRC has received your email (below) and is reviewing it. I will keep you informed regarding information that we can provide in response.

Thank you and best regards,  
Jon Hopkins  
Senior Project Manager for International Activities  
Office of Nuclear Reactor Regulation  
USNRC  
+1 301 415 3027  
[Jon.Hopkins@nrc.gov](mailto:Jon.Hopkins@nrc.gov)

**From:** Briegleb Pierre [mailto:pierre.briegleb@belv.be]  
**Sent:** Wednesday, July 25, 2012 3:40 AM  
**To:** [Sebastien.CROMBEY@cea.fr](mailto:Sebastien.CROMBEY@cea.fr); CRESPO BRAVO JULIO; Hardies, Robert; Collins, Jay; Kirk, Mark; [petteri.tilppana@stuk.fi](mailto:petteri.tilppana@stuk.fi); [dietmar.Kalkhof@ensi.ch](mailto:dietmar.Kalkhof@ensi.ch); [kees.desbouvrie@minvrom.nl](mailto:kees.desbouvrie@minvrom.nl)  
**Cc:** De Boeck Benoit; Barras Pierre; Hoebeek Simon; Fonkwa Christelle; Deledicque Vincent; SCHRAUBEN Manfred; WERTELAERS An; VAN WONTERGHEM Frederik; [TOMBUYES Beatrice](mailto:TOMBUYES Beatrice); [aweyn@vincotte.be](mailto:aweyn@vincotte.be)  
**Subject:** Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

Dear Sirs,

We are now facing in Belgium a potential problem on the reactor pressure vessel (RPV) of the Doel 3 NPP. Non-destructive examination revealed a lot of "indications" that need to be confirmed by another inspection technique (ongoing).

We would like to have your feedback, experience and advice regarding this potential problem.  
You will find hereunder a more comprehensive background and some questions we would like to answer.

Best regards,

Pierre Briegleb  
National Project Coordinator  
Bel V – Subsidiary of the Federal Agency for Nuclear Control (Belgium)

#### Potential problem on the reactor pressure vessel

Belgian pressure vessels are inspected according to ASME XI. Volumetric inspections of the beltline zone are normally limited to the circumferential welds and surrounding heat affected zone and base material, within the limits settled by the code.

Additionally, as a result of the experience at Tricastin, inspections aiming at detecting possible underclad defects in the pressure vessel beltline region are planned for all Belgian plants. The first inspection of this kind took place at Doel 3 this summer.

These inspections are performed with a qualified method and encompass the whole height of the vessel beltline region. This means that we inspect clad base material in zones where no volumetric in-service inspection was performed up to now.

At Doel 3, according to the Owner, no underclad defects were detected.

Nevertheless, lot of defect indications of an apparently different type were detected by this UT-inspection aiming at detecting underclad defects, especially in one of the three forged rings (SA-508-cl.3). These indications appear to be laminar flaws, more or less parallel to the inner/outer surface of the pressure vessel, located in- and outside the inspected zone where underclad defects were looked at. Obviously, it is not possible to justify those indications on a one-by-one basis by means of an analytical evaluation according to the App. A of ASME XI code requirements.

The inspection method which revealed the presence of those defects has been qualified for detecting underclad defect.

An inspection of the whole height with the qualified method used to control the beltline welds started on the 16<sup>th</sup> of July; the results should not be available before begin of August. Similar inspections will be performed at Tihange 2 during the month of August.

In the absence of any other explanation at this stage, the Owner supposes to be in presence of fabrication defects.

The Doel 3 and Tihange 2 RPVs were forged by Rotterdam Dockyards (RDM), which according to the Owner provided some 24 vessels in Europe and the US. NUREG 1511 – Suppl. 2, p. 7-3, identifies 8 US units with RDM forged rings. Other European countries possibly concerned are Spain, Switzerland, the Netherlands (Borssele, Dodewaard), and probably others, not identified by Bel V at this stage.

Some questions:

1. Are there in your country RPVs (forged rings) fabricated by Rotterdam Dockyards (RDM)?
2. Is there any known concern with respect to fabrication defects in those rings?

3. Did you perform volumetric inspections in the beltline region which could have detected laminar defects in the beltline base material (a) during fabrication (b) in-service? If the answer is yes, describe which inspection (type, extent, frequency) and the corresponding results.
4. Do you perform inspections aiming at detecting underclad defects? If so, describe which inspection (type, extent, frequency) and the corresponding results.

**Bartley, Jonathan**

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**From:** Bartley, Jonathan  
**Sent:** Friday, August 03, 2012 9:44 AM  
**To:** Zeiler, John  
**Subject:** RE: laminations detected in Belgian reactor vessel (not good)

Great thanks. I am sure the NRC will be doing something. Just don't know what.

**From:** Zeiler, John  
**Sent:** Friday, August 03, 2012 9:08 AM  
**To:** Bartley, Jonathan  
**Subject:** RE: laminations detected in Belgian reactor vessel (not good)

Already discussed with S. Capps earlier this morning. He is turning on his ISI engineers to get more info prior to Unit 2 RFO.

John Zeiler  
Senior Resident Inspector  
McGuire Nuclear Station  
Region II, USNRC  
704-875-1681 (office)  
(b)(6) cell)

**From:** Bartley, Jonathan  
**Sent:** Friday, August 03, 2012 8:43 AM  
**To:** Zeiler, John; Heath, Jermaine; Hutto, Andy; Cureton, Ronald  
**Cc:** Rapp, Curtis; Croteau, Rick; Jones, William; Ellis, Kevin; Sabisch, Andrew; Ottenberg, Geoffrey  
**Subject:** FW: laminations detected in Belgian reactor vessel (not good)

FYI. Will affect Catawba and McGuire. NRC response TBD.

**From:** Freeman, Scott  
**Sent:** Friday, August 03, 2012 7:53 AM  
**To:** Bartley, Jonathan; Shaeffer, Scott; McCoy, Gerald  
**Subject:** FW: laminations detected in Belgian reactor vessel (not good)

See below. At the Belgian reactor below the owner has found evidence of laminar flaws in one of the forged rings on the reactor vessel. This vessel was made at the same Rotterdam yard that is linked to Rx head problems. Several US reactor vessels were also made there. You can see below but it looks to be: Catawba 1, McGuire 2, North Anna 1, North Anna 2, Quad Cities 1, Sequoyah 1, Sequoyah 2, Surry 1, Surry 2, Watts Bar 1.

The conE folks will look at this but I just wanted to make you aware.

**From:** Harmon, David  
**Sent:** Thursday, August 02, 2012 3:31 PM  
**To:** R2DCI\_B3  
**Cc:** Collins, Brendan; Sengupta, Abhijit; Issa, Alfred  
**Subject:** laminations detected in Belgian reactor vessel (not good)

**Dave's Summary:**

During ISI inspections at Doel 3 (in Belgium) laminations were detected in the reactor vessel forged rings.

The vessel was made by Rotterdam Droogdok Maatschappij (also referred to as Rotterdam Dockyards or RDM) The same folks that gave us reactor vessel heads with defects in the j-groove welds. Numerous reactor vessels from RDM are in service around the world and in the US.

ASME III requires 100% UT of class 1 materials and these defects should have been found during original fabrication of the vessel.

I recall hearing Jerry Blake talk about RDM and the NRC buying off on the licensees accepting vessels/heads with only a COC instead of the full set of records. Wish he was still here ☹

### **Subject**

Summary of the available information and preliminary evaluation by Bel V pertaining to the indications of defects found in the Doel 3 RPV in June - July 2012.

### **Background**

Belgian reactor pressure vessels (RPV) are inspected according to ASME XI. Volumetric inservice-inspections of the beltline area are normally limited to the circumferential welds (there are no axial welds in the Belgian RPVs) and surrounding heat affected zone and base material, within the limits set by the code.

Additionally, as a result of the experience at Tricastin, inspections aiming at detecting possible underclad defects in the pressure vessel beltline region are planned for all Belgian plants. The first inspection of this kind took place at Doel 3 this summer.

These inspections are performed with a qualified UT-method for detection of underclad defects, cover a zone of about 30mm thickness from the inner RPV wall and encompass the whole height of the vessel beltline region. This means that clad base material was inspected where no volumetric in-service inspection was performed up to now.

### **Results of the inspection performed to detect and characterize underclad defects (June 2012)**

At Doel 3, no underclad defects were detected.

Nevertheless, lot of defect indications of an apparently different type were detected by this UT-inspection, especially in one of the three forged rings (SA-508-cl.3). These indications appear to be of a laminar type of flaw, more or less parallel to the inner/outer surface of the pressure vessel. These indications appear to be of a laminar type of flaw, more or less parallel to the inner/outer surface of the pressure vessel, located in and outside the inspected zone. Considering the fact that this inspection method is not qualified for detection at such location and for this type of indications, precise information about shape or dimension is not available at this stage. *First evaluation* shows that these sub-surface flaws are almost circular in shape with a mean diameter of about 15 mm (maximum 30 mm), with a flaw density up to 40 indications per dm<sup>3</sup>. Obviously, it is not possible to justify those indications on a one-by-one basis by means of an analytical evaluation according to the App. A of ASME XI code requirements.

### **Results of the second inspection performed to detect and characterize base material defects detected in June 2012 (July 2012)**

Considering the limitations of the inspection method which revealed the presence of those defects in the base material, an inspection of the whole height of the RPV with the UT-qualified method used to control the beltline welds has subsequently been performed. This inspection covers the whole thickness and the whole height of the RPV. Results will not be available before beginning of august.

However, the *preliminary* results of this second inspection can be so far summarized as follows:

- This inspection confirms the presence of a large amount of indications in the upper and lower shell rings.
- There is a marked disparity in the flaw densities (factor 1 to 5) between the upper and the lower shell rings. Some 10000 indications were detected in the lower shell ring.
- The shape of the flaw distribution is very similar in both cases.
- The bulk of the indications are located in the base material, outside the weld regions, in a thru thickness zone extending from about 30mm from the inner surface to one half of the RPV thickness.
- These flaw indications seem to be laminar in shape and have average diameters of 25 mm.

#### **Current investigations by the licensee**

- Upper and lower vessel rings of the Doel 3 and Tihange 2 RPVs were forged by the Rotterdam Droogdok Maatschappij (also referred to as Rotterdam Dockyards or RDM), at the same time and under the same contract.
- The fabrication of both RPVs took place in the same period, following the same requirements.
- According to the Owner, RDM provided 22 vessels in Europe and the US. The list of concerned units provided by the Owner encompasses following units, not necessarily with forged rings: Atucha 1 (Argentina); Doel 3, Tihange 2 (Belgium); Brunsbüttel, Philippsburg 1 (Germany); Borssele, Dodewaard (Netherlands); Santa María de Garoña, Cofrentes (Spain); Ringhals 2 (Sweden); Leibstadt, Mühleberg (Switzerland); Catawba 1, Mc Guire 2, North Anna 1, North Anna 2, Quad Cities 1, Sequoyah 1, Sequoyah 2, Surry 1, Surry 2, Watts Bar 1 (USA). RDM does not exist any more.
- The Owner is currently investigating the inspection results. In parallel additional studies are being performed to analyze and, if possible, to validate and confirm the structural integrity of the vessel.
- In the absence of any other explanation at this stage, the licensee supposes the presence of fabrication defects, but does not exclude other explanations.
- Investigations are conducted to retrieve information pertaining to the fabrication and the associated controls. According to the Owner, the defects detected in 2012 should have been detected with the UT procedures used to control the base material at that time. The results of these inspections are not retrieved yet.
- A justification of the observed defects for further exploitation is required by the Belgian regulations, based on ASME XI, App. A. According to first evaluations made by the Owner, alternate requirements will be necessary. The Owner is investigating a. o. alternative rules for regrouping individual indications. A PTS study based on 10CFR50.61a is planned.
- An inspection similar to the inspection performed in July 2012 at Doel 3 will be performed at another Belgian reactor vessel (unit 2 Tihange NPP), during the upcoming outage within a few weeks.


#### **Actions taken by the Belgian Authorities**

- Communication with foreign countries: preliminary IRS; direct contacts with Safety Authorities of foreign countries having RPVs fabricated by RDM.
- Review of the available information w.r.t. the fabrication of the Doel 3 and Tihange 2 RPVs.
- Preliminary evaluation of the approaches aiming at justifying the observed defects for further exploitation.
- Further contacts with the Owner

#### **Preliminary evaluation results by Bel V**

- We retrieved very few information pertaining to the fabrication (process, follow-up...). Nevertheless, there exist some evidences of difficulties during fabrication, due to strikes, delays and technical problems.
- The lack of information related to the origin of the defects, their unusual high density in some portions of the RPV are a.o. elements which could possibly question the applicability of the justification methods proposed by the Owner. It is e.g. unclear whether the basic assumptions behind ASME XI, App. A and 10CFR50.61a are compatible with this case.

Thanks,  
Dave Harmon



US NRC Construction Inspector

RII/CCI/DCI/CIB3 - Welding  
404-997-4447

Poehler, Jeffrey

From: Poehler, Jeffrey *JRR*  
Sent: Friday, August 10, 2012 3:37 PM  
To: Hardies, Robert  
Subject: RE: More Belgian-related info

I'm not sure if you can resolve it in Belgium. It depends on how accurate RVID is. The data the media found appears to be Eason's database. We may have to go back to the source documents for RVID.

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

-----Original Message-----

From: Hardies, Robert *JRR*  
Sent: Friday, August 10, 2012 3:08 PM  
To: Hiland, Patrick; Poehler, Jeffrey  
Cc: Burnell, Scott; McIntyre, David; Lupold, Timothy; Cheok, Michael  
Subject: RE: More Belgian-related info

Okay

-----Original Message-----

From: Hiland, Patrick *JRR*  
Sent: Friday, August 10, 2012 12:55 PM  
To: Poehler, Jeffrey; Hardies, Robert  
Cc: Burnell, Scott; McIntyre, David; Lupold, Timothy; Cheok, Michael  
Subject: FW: More Belgian-related info

Jeff, Carla compared the attached data-base (provided by media search of ADAMS) against the list of RDM RPVs provided by the Belgium regulator. There appears to be a discrepancy in the attached list or in the Belgium's listing of U.S. plants manufactured by RDM, i.e. QC-1 is listed in the attached as a B&W manufactured RPV, not RDM. Can EVIB look into the discrepancy next week?

Bob Hardies, please put this discrepancy on your list of things to do resolve during your visit to Belgium.

-----Original Message-----

From: Burnell, Scott *SCB*  
Sent: Friday, August 10, 2012 12:02 PM  
To: Hiland, Patrick; McIntyre, David; Evans, Michele; Boger, Bruce; Dorman, Dan; McIntyre, David; Hopkins, Jon; Hardies, Robert  
Subject: More Belgian-related info

All;

It appears folks are getting better at ADAMS searches. A reporter came across this RPV embrittlement database and is using it to ID U.S. plants with vessels from the manufacturer in question. I walked her through how this document covers a different issue than what's under discussion with Doel.



Scott

-----Original Message-----

From: CHRISTINE HARVEY (BLOOMBERG/ NEWSROOM) [mailto:charvey32@bloomberg.net]  
Sent: Friday, August 10, 2012 11:49 AM  
To: Burnell, Scott  
Subject:

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Christine Harvey

Bloomberg News

P: (212) 617-0649

(b)(6)

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**Poehler, Jeffrey**

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**From:** Poehler, Jeffrey  
**Sent:** Friday, August 10, 2012 1:55 PM  
**To:** Hiland, Patrick  
**Subject:** RE: More Belgian-related info

Will do.

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

-----Original Message-----

**From:** Hiland, Patrick  
**Sent:** Friday, August 10, 2012 1:49 PM  
**To:** Poehler, Jeffrey  
**Subject:** RE: More Belgian-related info

Jeff, if possible, resolve the discrepancies between the lists next week.

-----Original Message-----

**From:** Poehler, Jeffrey  
**Sent:** Friday, August 10, 2012 1:46 PM  
**To:** Hiland, Patrick; Hardies, Robert  
**Cc:** Burnell, Scott; McIntyre, David; Lupold, Timothy; Cheok, Michael; Fairbanks, Carolyn; Sheng, Simon  
**Subject:** RE: More Belgian-related info

EVIB's RVID database shows 7 reactors manufactured by RDM. They are:

Catawba 1  
McGuire 1  
North Anna 1  
North Anna 2  
Sequoyah 1  
Sequoyah 2  
Watts Bar 1

Our database does not list Surry 1 and 2 or Quad Cities 1 as RDM.

We still consider RVID to be the official database even though it has not been updated after 2002. It is based on licensee submittals on the docket from things like Generic Letter 92-01. At any rate vessel manufacturer should be accurate as far as what the licensees told us. In some rare cases vessels were started at one shop and finished at another.

The embrittlement database from ADAMS appears to be one used to develop an updated embrittlement correlation that is used in the alternate PTS rule.

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

-----Original Message-----

From: Hiland, Patrick  
Sent: Friday, August 10, 2012 12:55 PM  
To: Poehler, Jeffrey; Hardies, Robert  
Cc: Burnell, Scott; McIntyre, David; Lupold, Timothy; Cheek, Michael  
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Bob Hardies, please put this discrepancy on your list of things to do resolve during your visit to Belgium.

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From: Burnell, Scott  
Sent: Friday, August 10, 2012 12:02 PM  
To: Hiland, Patrick; McIntyre, David; Evans, Michele; Boger, Bruce; Dorman, Dan; McIntyre, David; Hopkins, Jon; Hardies, Robert  
Subject: More Belgian-related info

All;

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Sent: Friday, August 10, 2012 11:49 AM  
To: Burnell, Scott  
Subject:

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Christine Harvey  
Bloomberg News  
O: (212) 617-0649

C:

(b)(6)

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Poehler, Jeffrey

From: Burnell, Scott *10/PA*  
Sent: Friday, August 10, 2012 3:18 PM  
To: Poehler, Jeffrey; Hiland, Patrick; Hardies, Robert  
Cc: McIntyre, David; Lupold, Timothy; Cheok, Michael; Fairbanks, Carolyn; Sheng, Simon  
Subject: RE: More Belgian-related info

FYI, I just got a call from my counterpart at PNNL -- Platts called looking for generic information on the types of flaws that might be found in RPVs (as far as I could tell from the conversation PNNL described). I relayed that we're still in info-gathering mode and not speculating on either Doel's condition or potential ramifications.

-----Original Message-----

From: Poehler, Jeffrey *JRP*  
Sent: Friday, August 10, 2012 1:46 PM  
To: Hiland, Patrick; Hardies, Robert  
Cc: Burnell, Scott; McIntyre, David; Lupold, Timothy; Cheok, Michael; Fairbanks, Carolyn; Sheng, Simon  
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Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

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Sent: Friday, August 10, 2012 12:55 PM  
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Bob Hardies, please put this discrepancy on your list of things to do resolve during your visit to Belgium.

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From: Burnell, Scott

Sent: Friday, August 10, 2012 12:02 PM

To: Hiland, Patrick; McIntyre, David; Evans, Michele; Boger, Bruce; Dorman, Dan; McIntyre, David; Hopkins, Jon; Hardies, Robert

Subject: More Belgian-related info

All;

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Scott

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From: CHRISTINE HARVEY (BLOOMBERG/ NEWSROOM) [mailto:charvey32@bloomberg.net]

Sent: Friday, August 10, 2012 11:49 AM

To: Burnell, Scott

Subject:

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Christine Harvey

Bloomberg News

O: (212) 617-0649

C: (b)(6)

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**Poehler, Jeffrey**

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**From:** Poehler, Jeffrey *NR*  
**Sent:** Friday, August 10, 2012 11:14 AM  
**To:** Lupold, Timothy; Hiland, Patrick  
**Subject:** RE: rapidly moving media story

They were looking for underclad cracking, that's why they went beyond the normal inspection volume (according to the Word Document).

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

**From:** Lupold, Timothy *NR*  
**Sent:** Friday, August 10, 2012 11:12 AM  
**To:** Hiland, Patrick; Poehler, Jeffrey  
**Subject:** RE: rapidly moving media story

We should be able to address many of them. We cannot speak for their regulator or what they are requiring the licensee to do. Part of what this meeting that Bob is attending is to discuss the issue and determine what future actions may be appropriate. As of now, inspections are planned at Tihange U2. I do not know why they were doing the inspections in the areas they were doing them. The areas where they detected these indications are outside of the areas that are required to be inspected.

**From:** Hiland, Patrick *NR*  
**Sent:** Friday, August 10, 2012 11:02 AM  
**To:** Poehler, Jeffrey; Lupold, Timothy  
**Subject:** FW: rapidly moving media story  
**Importance:** High

Can the two of you address these topics?

**From:** Merzke, Daniel *NR*  
**Sent:** Friday, August 10, 2012 10:22 AM  
**To:** Hiland, Patrick  
**Cc:** Roque-Cruz, Carla; Rosenberg, Stacey; Dorman, Dan  
**Subject:** FW: rapidly moving media story  
**Importance:** High

Tom is also recommending someone who can speak to ISI and vessel inspections to attend the briefing this afternoon. The attached e-mail has additional information from Belgium (wait for the translation). As soon as someone can give me a name and availability, I'll work with the Chairman's office to set up the briefing.

Dan

**From:** Dorman, Dan *NR*  
**Sent:** Friday, August 10, 2012 10:14 AM  
**To:** Hiland, Patrick  
**Cc:** Boger, Bruce; Roque-Cruz, Carla; Merzke, Daniel

**Subject:** FW: rapidly moving media story  
**Importance:** High

Heads up -- looking for a brief to the Chairman on Doel 3 RPV issue and our plan of action.

**From:** Merzke, Daniel  
**Sent:** Friday, August 10, 2012 10:09 AM  
**To:** Roque-Cruz, Carla  
**Cc:** Boger, Bruce; Dorman, Dan  
**Subject:** FW: rapidly moving media story  
**Importance:** High

Carla, below is the information I got from Tom Hipschman. We need to set up a briefing for the Chairman this afternoon, if possible. Topics are what 10 U.S. plants had pressure vessels made from the same Belgian manufacturer, and what staff is planning to do with the information. I'm checking with OIP to see if they want to participate in the briefing as well. Obviously we're on a very short fuse for this one. Please let me know if someone in NRR can speak to these issues. Thanks.

Dan

**From:** Hipschman, Thomas *TCM*  
**Sent:** Friday, August 10, 2012 10:01 AM  
**To:** Merzke, Daniel  
**Subject:** FW: rapidly moving media story

**From:** Zimmerman, Jacob *JCM*  
**Sent:** Friday, August 10, 2012 9:58 AM  
**To:** Hipschman, Thomas; Sanfilippo, Nathan  
**Cc:** Niedzielski-Eichner, Phillip  
**Subject:** RE: rapidly moving media story

My recommendation is that the Chairman be provided a short briefing today of our current understanding of the issue and actions NRC Staff are taking in response to this information.

*Jake*

**Jacob I. Zimmerman**  
Deputy Chief of Staff  
Office of Chairman Allison M. Macfarlane  
U.S. Nuclear Regulatory Commission  
E-mail: [Jacob.Zimmerman@nrc.gov](mailto:Jacob.Zimmerman@nrc.gov) | Office: (301) 415-1220 |

## **NRC – One Mission – One Team**

**From:** Hipschman, Thomas  
**Sent:** Friday, August 10, 2012 9:48 AM  
**To:** Zimmerman, Jacob; Sanfilippo, Nathan  
**Cc:** Niedzielski-Eichner, Phillip  
**Subject:** RE: rapidly moving media story

I have a little background that came in. I'll look up some additional info. I can also ask the EDO's office if they have someone that can brief the Chairman if you want.

Tom

**From:** Zimmerman, Jacob  
**Sent:** Friday, August 10, 2012 9:46 AM  
**To:** Sanfilippo, Nathan; Hipschman, Thomas  
**Cc:** Niedzielski-Eichner, Phillip  
**Subject:** FW: rapidly moving media story

Nathan/Tom

Not sure how you have handled this in the past, but this is something you need to be in the loop on in support of Chairman Macfarlane.

*Jake*

**Jacob I. Zimmerman**  
Deputy Chief of Staff  
Office of Chairman Allison M. Macfarlane  
U.S. Nuclear Regulatory Commission  
E-mail: [Jacob.Zimmerman@nrc.gov](mailto:Jacob.Zimmerman@nrc.gov) | Office: (301) 415-1220 |

## **NRC – One Mission – One Team**

**From:** Brenner, Elliot *EB*  
**Sent:** Friday, August 10, 2012 9:43 AM  
**To:** Niedzielski-Eichner, Phillip  
**Cc:** Zimmerman, Jacob; Johnson, Michael  
**Subject:** rapidly moving media story

We are starting to take calls about the Belgian announcement that what appear to be indications of potential cracks or problems have been found with one of their reactors. The Belgians report there are 10 U.S. reactors with pressure vessels from the same Belgian manufacturer, though we do not know if the manufacturing processes were the same. They date back to the '60 and '70s in manufacturer, and some (Watts Bar) were not put in service until the '90s.

We are telling reporters that at Belgium's request the NRC is sending an expert over to a meeting of countries with vessels from the same manufacturer, that we want to learn more about the testing that was done and methods that were used, and that we have no indication now of any issues with the U.S. reactors. We will also say that we are independently verifying the history of these vessels. We will point the reporters on background to an instance in this country several years ago in which there was a flurry of concern about indications from a non-destructive examination of a reactor component, and it later turned out the testing was done incorrectly, hence our interest in how the tests were done in Belgium.

Eliot

Eliot Brenner  
Director, Office of Public Affairs  
Nuclear Regulatory Commission  
Rockville, Md.  
O: 301-415-8200



C:

(b)(6)

11

**Hardies, Robert**

**From:** VAN WONTERGHEM Frederik [Frederik.VANWONTERGHEM@FANC.FGOV.BE]  
**Sent:** Monday, August 13, 2012 10:35 AM  
**To:** jean-luc.lachaume@asn.fr; francois.balestreri@irsn.fr; Sebastien.CROMBEZ@asn.fr; Klaus.Germerdonk@ensi.ch; Ryf Martin; Hardies, Robert; lutz.lindhorst@ilent.nl; Wiel, ir. L. van der; C.Hoogwerf@mineleni.nl; erik.zeelenberg@lr.org; Thomas.Schimpfke@grs.de; Mihdi.Elmas@grs.de; bsf@csn.es; stephen.druce@hse.gsi.gov.uk; Richard.Sundberg@ssm.se  
**Cc:** VERTELAERS An; SCHRAUBEN Manfred; DE ROOVERE Willy; TOMBUYES Beatrice; OULIDDREN Kamreddine; pierre.barras@belv.be; pierre.briegleb@belv.be; henri.drymael@belv.be; simon.hoebeeck@belv.be; Tang Tchien Minh; Deledicque Vincent; Deprez Marc; aweyn@vincotte.be; hvandriessche@vincotte.be; yves.comptdaer@electrabel.com; VINCK Marion; VAN MECHELEN Nadia  
**Subject:** Technical Meeting "indications in Doel 3 Reactor Pressure Vessel" : August 16  
**Attachments:** Doel 3 Working Meeting 2012-08-16 Participants list - CONFIRMED.xlsx

Dear participants to the Doel 3 RPV workshop,

This technical working meeting shall take place in Brussels on **Thursday 16 August between 10h00 and 16h00.**

Change in venue:

Based on the number of participants, the FANC has decided to move the technical meeting to a meeting room in the conference centre of the **Federation of Entreprises in Belgium (FEB-VBO), Ravensteinstraat 4, 1000 Brussels** (just 100m away from the FANC offices). This conference centre is a short walk from the central railway station (Bruxelles Central/Brussel Centraal).

More information on how to reach this conference centre can be found on this website: <http://vbo-feb.be/en/location/>

Registration of participants for this meeting will start at 9h30 at the FEB-VBO offices. Only registered participants (see list in attachment) will be accepted to participate to the meeting.

Should additional members of your organisation wish to participate, please send me a reply by email as soon as possible. A hand-out of all presentations during the meeting will be provided at the start of the meeting.

At the moment, the following organisations have already confirmed their participation to the working meeting

- Belgium: FANC, Bel V, AIB Vincotte International
- France : ASN, IRSN
- Switzerland: ENSI
- Netherlands: KFD, Ministry of E L&I , Lloyds Register
- Germany: GRS
- Spain: CSN
- United Kingdom: ONR
- Sweden: SSM

The preliminary agenda for the meeting is as follows:

1. Introduction (FANC)
2. Presentation of inspection results at Doel 3 (Electrabel – Tractebel Engineering)
  - Regulatory framework
  - Construction File of Doel 3 RPV
  - Manufacturing & In-Service Inspections results
  - Metallurgical origin of the indications found at Doel 3
  - Justification strategy for the indications found at Doel 3Q&A
3. Presentation of Belgian regulatory body approach for this issue (FANC- Bel V – AIB Vincotte)
4. Presentation on international feedback on questionnaire (Bel V)
  - RDM vessels in the world
  - In-service inspection & results

5. Roundtable discussion between regulatory bodies:

- Similar in service inspections performed in your countries on the reactor vessels forged by RDM (and possible results)
- Comments on the proposed licensee approach to justify the structural integrity of the reactor vessel
- Implications for other NPPs in the world: possible actions to be taken

If you have any further questions, feel free to contact me (tel. (b)(6))

Best regards,

Frederik Van Wonterghem

Department of Nuclear Facilities and Waste  
Federal Agency for Nuclear Control  
Ravensteinstraat 36, 1000 Brussel, Belgium  
[www.fanc.fgov.be](http://www.fanc.fgov.be)

Tel.: +32 (0)2 289 20 82

Fax: +32 (0)2 289 21 12

Mobile : (b)(6)

**Van:** VAN WONTERGHEM Frederik

**Verzonden:** 08 August 2012 17:06

**Aan:** 'Andre-claude.lacoste@asn.fr'; 'jean-luc.lachaume@asn.fr'; 'francois.balestreri@irsn.fr'; 'Sebastien.CROMBEZ@asn.fr'; 'info@arn.gob.ar'; 'gerald.hennenhoefer@bmu.bund.de'; 'martina.palm@bmu.bund.de'; 'Ulrich.Erven@grs.de'; 'Carla.Schwaeger@grs.de'; 'a.vanlimborgh@mineleni.nl'; 'kees.desbouvrie@minvrom.nl'; 'lutz.lindhorst@ilent.nl'; 'bert.verweij@minvrom.nl'; 'Roeland.Nieuweboer@minvrom.nl'; 'cmt@csn.es'; 'fjarana@mityc.es'; 'jcb@csn.es'; 'jzj@csn.es'; 'imj@csn.es'; 'ann-louise.eksborg@ssm.se'; 'Anders.Hallman@ssm.se'; 'Lars.Skanberg@ssm.se'; 'perolof.hagg@ssm.se'; 'petteri.tilppana@stuk.fi'; 'hans.wanner@ensi.ch'; 'georg.schwarz@ensi.ch'; 'markus.straub@ensi.ch'; 'dietmar.Kalkhof@ensi.ch'; 'Jon.Hopkins@nrc.gov'; 'Mark.Kirk@nrc.gov'; 'Robert.Hardies@nrc.gov'; 'Jay.Collins@nrc.gov'

**CC:** WERTELAERS An; SCHRAUBEN Manfred; DE ROOVERE Willy; TOMBUYES Beatrice; pierre.barras@belv.be; pierre.briegleb@belv.be; Benoît DE BOECK (benoit.deboeck@belv.be) (benoit.deboeck@belv.be); aweyn@vincotte.be; hvandriessche@vincotte.be

**Onderwerp:** RE: URGENT Message on Nuclear Safety: Flaw indications in Doel 3 Reactor Pressure Vessel

Dear all

I would like to give you some additional information regarding the working meeting of Thursday 16 August:

1. All presentations and discussions during the meeting will be conducted in English
2. At the start of the meeting, the licensee of the Doel NPP (Electrabel) will give a presentation containing the latest information on the flaw indications found at Doel 3, possible causes and the ongoing licensee studies. After this presentation, specific questions can be addressed to the licensee.
3. As mentioned already in the mailing, the roundtable discussion between regulatory bodies should focus on the following main topics:
  - Similar in service inspections performed in your countries on the reactor vessels forged by RDM (and possible results)
  - Comments on the proposed licensee approach to justify the structural integrity of the reactor vessel
  - Implications for other NPPs in the world: possible actions to be taken
4. At the moment, the following organisations have already confirmed their participation to the working meeting
  - a. Belgium: FANC, Bel V, AIB Vincotte International
  - b. France : ASN, IRSN
  - c. Switzerland: ENSI

Best regards

Frederik Van Wonterghem

**Van:** VAN WONTERGHEM Frederik

**Verzonden:** 03 August 2012 11:05

**Aan:** 'Andre-claude.lacoste@asn.fr'; 'jean-luc.lachaume@asn.fr'; 'francois.balestreri@irsn.fr'; 'Sebastien.CROMBEZ@asn.fr'; 'info@arn.gob.ar'; 'gerald.hennenhoefer@bmu.bund.de'; 'martina.palm@bmu.bund.de'; 'Ulrich.Erven@grs.de'; 'Carla.Schwaeger@grs.de'; 'a.vanlimborgh@mineleni.nl'; 'kees.desbouvrie@minvrom.nl'; 'bert.verwelj@minvrom.nl'; 'Roeland.Nieuweboer@minvrom.nl'; 'cmt@csn.es'; 'fjarana@mityc.es'; 'jcb@csn.es'; 'ann-louise.eksborg@ssm.se'; 'Anders.Hallman@ssm.se'; 'Lars.Skanberg@ssm.se'; 'perolof.hagg@ssm.se'; 'petteri.tiippana@stuk.fi'; 'hans.wanner@ensi.ch'; 'georg.schwarz@ensi.ch'; 'markus.straub@ensi.ch'; 'dietmar.Kalkhof@ensi.ch'; 'Jon.Hopkins@nrc.gov'; 'Mark.Kirk@nrc.gov'; 'Robert.Hardies@nrc.gov'; 'Jay.Collins@nrc.gov' **CC:** WERTELAERS An; SCHRAUBEN Manfred; DE ROOVERE Willy; TOMBUYES Beatrice; [pierre.briegleb@belv.be](mailto:pierre.briegleb@belv.be); 'Benoit DE BOECK ([benoit.deboeck@belv.be](mailto:benoit.deboeck@belv.be))' ([benoit.deboeck@belv.be](mailto:benoit.deboeck@belv.be)); 'aweyn@vincotte.be'; 'hvandriessche@vincotte.be'

**Onderwerp:** URGENT Message on Nuclear Safety: Flaw Indications in Doel 3 Reactor Pressure Vessel

Dear all,

This week, a preliminary IRS Incident Report was published by Belgium related to the detection of a large number of flaw indications in the reactor pressure vessel of Doel 3 (PWR - Framatome Design). (Reference IRS Number 8244: "FLAWS INDICATIONS IN THE REACTOR PRESSURE VESSEL"). In attachment you can find a copy of this IRS report.

As indicated in the IRS report, the Doel 3 NPP outage has been extended to allow further inspections and to perform additional studies by the licensee to analyze and, if possible, to validate and confirm the structural integrity of the vessel. At the moment, the licensee supposes that the flaw indications were already present at the moment of forging of the vessel, which was done by Rotterdam Droogdok Maatschappij (also referred to as Rotterdam Dockyards or RDM). Both a deterministic approach (in accordance with ASME XI Appendix A) and a probabilistic approach (in accordance with 10CFR50.61a) are being considered by the licensee to justify the structural integrity of the reactor vessel.

Some additional information on the types of flaw indications and other possible reactor vessels forged by this company can be found below.

Considering the potential consequences of this event, the Belgian regulatory body would like to organise on short notice a technical working meeting in Brussels on this issue for those regulatory bodies which could be interested by these findings, specifically those regulatory bodies of countries where RPVs forged by RDM can be present. During this technical working meeting, additional information on the results found at Doel 3 NPP and the on-going licensee investigations and calculations will be made available by the Belgian regulatory body (FANC, its technical support organisation Bel V and the Authorized Inspection Authority AIB Vincotte International). In addition, a roundtable discussion between regulatory bodies will be held to discuss relevant experiences with this kind of inspections and flaw indications. Specific topics/questions to be discussed during this roundtable discussion are mentioned in an email by Bel V which was sent last week (see attachment). We are especially interested to know if this type of ISI was already performed in your countries on the reactor vessels forged by this company, and if so, what the results have been. May we kindly invite every country to present additional available input and thoughts to our working meeting.

**This technical working meeting shall take place in Brussels (FANC offices, Ravensteinstraat 36, 1000 Brussels) on Thursday 16 August between 10h00 and 16h00.**

We would be very grateful if one or more technical experts of your organisation could be present during this working meeting.

To confirm your participation, please send me a reply by email to [frederik.vanwongerghem@fanc.fgov.be](mailto:frederik.vanwongerghem@fanc.fgov.be) (tel. ++32 2 289 2082) before Friday 10 August.

If you have further technical questions on this event, you can contact [pierre.briegleb@belv.be](mailto:pierre.briegleb@belv.be) (tel ++32 2 528 0245).

A second technical working meeting could be held in the near future (presumably early September) to discuss the available results of the additional inspections at Tihange 2 and the results of the licensee investigations and calculations aiming to confirm the structural integrity of the reactor vessel. Further actions in your countries can also be discussed during this second meeting. We will inform you as soon as possible of the timing of this second working meeting.

Best regards,

Frederik Van Wonterghem

Department of Nuclear Facilities and Waste  
Federal Agency for Nuclear Control  
Ravensteinstraat 36, 1000 Brussel, Belgium  
[www.fanc.fgov.be](http://www.fanc.fgov.be)  
Tel.: +32 (0)2 289 20 82  
Fax: +32 (0)2 289 21 12

#### **Additional information on the types of flaw indications and other possible reactor vessels**

##### Preliminary results from additional inspections

- As described in the IRS message, considering the limitations of the inspection method which revealed the presence of those defects, an inspection of the whole height of the RPV with the UT-qualified method used to control the beltline welds has subsequently been performed. This inspection covers the whole thickness and the whole height of the RPV of Doel 3.
- The preliminary results from those additional inspections confirm the presence of several thousand (up to 10000) flaw indications in the reactor vessel base material. These flaw indications seem to be laminar in shape and have average diameters of 25 mm.

##### Reactor Pressurized Vessels forged by Rotterdam Droogdok Maatschappij (also referred to as Rotterdam Dockyards or RDM)

- The Doel 3 and Tihange 2 RPVs were forged by RDM, which according to the Licensee Electrabel provided some 20+ vessels in Europe and the US.
- The table below gives an overview of these RPVs (this list has been established by the licensee and could contain errors or omissions).

|                                 |      |   |      |      |                  |
|---------------------------------|------|---|------|------|------------------|
| Atucha 1                        | PHWR |   | 335  | 1980 | Siemens          |
| Doel 3                          | PWR  | 3 | 1000 | 1982 | Framatome        |
| Tihange 2                       | PWR  | 3 | 1000 | 1982 | Framatome        |
| Brünsbuttel                     | BWR  | - | 770  | 1977 | KWU              |
| Philippsburg 1                  | BWR  | - | 890  | 1980 | KWU              |
| Dodewaard                       | BWR  | - | 52   | 1968 | RDM              |
| Borssele                        | PWR  | 2 | 515  | 1973 | KWU              |
| S <sup>ta</sup> Maria de Garona | BWR  |   | 450  | 1971 | General Electric |
| Cofrentes                       | BWR  | - | 1064 | 1984 | General Electric |
| Ringhals 2                      | PWR  | 3 | 813  | 1974 | Westinghouse     |
| Leibstadt                       | BWR  | - | 1165 | 1984 | General Electric |
| Mühleberg                       | BWR  | - | 373  | 1971 | General Electric |
| Catawba 1                       | PWR  | 4 | 1129 | 1985 | Westinghouse     |
| McGuire 2                       | PWR  | 4 | 1100 | 1983 | Westinghouse     |
| North Anna 1                    | PWR  | 3 | 903  | 1978 | Westinghouse     |
| North Anna 2                    | PWR  | 3 | 973  | 1980 | Westinghouse     |
| Quad Cities 1                   | BWR  | - | 882  | 1972 | General Electric |
| Sequoyah 1                      | PWR  | 4 | 1162 | 1980 | Westinghouse     |
| Sequoyah 2                      | PWR  | 4 | 1126 | 1981 | Westinghouse     |
| Surry 1                         | PWR  | 3 | 839  | 1972 | Westinghouse     |
| Surry 2                         | PWR  | 3 | 800  | 1973 | Westinghouse     |

**FANC****FCN**

Het FANC is ISO 9001:2008 gecertificeerd – L'AFCN est certifiée ISO 9001:2008.

Le document est fourni en français et en anglais.  
Les documents sont environnementaux avant d'imprimer ce pdf.

Disclaimer (Fr) - Disclaimer (Nl)

Ring, Mark

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**From:** DiFrancesco, Nicholas  
**Sent:** Tuesday, August 14, 2012 7:49 AM  
**To:** McGhee, James; Cushman, Brian  
**Cc:** Ring, Mark  
**Subject:** Quad Cities 2 - RPV Manufacturing  
**Attachments:** QDC UFSAR Rev 11 Section 5.3.1.2.pdf; 1 Quad Cities II Manufacturing History .pdf; Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP; Doel 3 - RPV preliminary IRS report\_final.docx; ACTION: Followup of list of NPPs with RPVs forged by Rotterdam Dockyards (RDM)

**Importance:** High

Jim and Brian,

A email chain for your awareness regarding the Quad Cities 2 RPV manufacturing. NRR management polled licensees yesterday to locate RPVs built by Rotterdam Dockyards.

The concern with Doel 3 seemed to be more related to forgings.

Regards,

*Nick*

Project Manager - LaSalle and Power Uprate Program (Backup for Quad Cities)  
U.S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
Division of Operating Reactor Licensing  
[nicholas.difrancesco@nrc.gov](mailto:nicholas.difrancesco@nrc.gov) | Tel: (301) 415-1115

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**From:** DiFrancesco, Nicholas  
**Sent:** Monday, August 13, 2012 2:49 PM  
**To:** Meighan, Sean  
**Cc:** Dudek, Michael  
**Subject:** Completed: Quad Cities 1 - RPV Forging  
**Importance:** High

Sean,

This completes the request for information. Quad Cities 2 is listed in NUREG-1511 Supplement 1 as partially manufactured by Rotterdam (and not Quad Cities 1 – listed in the original request).

Thanks,  
*Nick*

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**From:** [Mitchel.Mathews@exeloncorp.com](mailto:Mitchel.Mathews@exeloncorp.com) [<mailto:Mitchel.Mathews@exeloncorp.com>]  
**Sent:** Monday, August 13, 2012 2:27 PM  
**To:** DiFrancesco, Nicholas; [David.Gullott@exeloncorp.com](mailto:David.Gullott@exeloncorp.com)  
**Cc:** Mozafari, Brenda; [joseph.bauer@exeloncorp.com](mailto:joseph.bauer@exeloncorp.com); Dudek, Michael; [Wally.Beck@exeloncorp.com](mailto:Wally.Beck@exeloncorp.com); [glen.kaegi@exeloncorp.com](mailto:glen.kaegi@exeloncorp.com)  
**Subject:** RE: Inquiry: Quad Cities 1 - RPV Forging  
**Importance:** High

Nick,

According to the attached Quad Cities UFSAR Section 5.3.1.2 and Manufacturing History, the Quad Cities, Unit 1 RPV was manufactured entirely by Babcock & Wilcox. The Unit 2 RPV history did not include any forging at Rotterdam (RDM), but did include assembly and welding on portions of the RPV at RDM.

Please let me know if you have additional questions or concerns.

Regards,

Mitch

**Mitchel Mathews**  
**Sr. Regulatory Engineer**  
**Corporate Licensing**

 **Exelon** Generation.

4300 Winfield Road - 4<sup>th</sup> Floor  
Warrenville, IL 60555

Office: 630-657-2819 | Pager: (b)(6) | Fax: 630-657-4327  
[Mitchel.Mathews@exeloncorp.com](mailto:Mitchel.Mathews@exeloncorp.com)

---

**From:** DiFrancesco, Nicholas [<mailto:Nicholas.DiFrancesco@nrc.gov>]  
**Sent:** Monday, August 13, 2012 11:17 AM  
**To:** Gullott, David M.:(GenCo-Nuc); Mathews, Mitchel:(GenCo-Nuc)  
**Cc:** Mozafari, Brenda; Bauer, Joseph A.:(GenCo-Nuc); Dudek, Michael  
**Subject:** Inquiry: Quad Cities 1 - RPV Forging

David, Mitch,

Please verify whether Quad Cities Unit 1 Reactor Pressure Vessel was forged by Rotterdam Droogdok Maatschappij (also referred to as Rotterdam Dockyards or RDM). The RPV forgings may have been welded together by another company such as B&W. NRC is interested in who forged the parts.

Attached documents contain information related to the problem and technical concern.

Please provide a response COB today.

Sincerely,

Nick

Project Manager - LaSalle and Power Uprate Program  
U.S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
Division of Operating Reactor Licensing  
[nicholas.difrancesco@nrc.gov](mailto:nicholas.difrancesco@nrc.gov) | Tel: (301) 415-1115

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**Hardies, Robert**

**From:** Kirk, Mark (RES)  
**Sent:** Tuesday, August 14, 2012 2:10 PM  
**To:** Hardies, Robert  
**Subject:** Fw: some information

See below news articles, and validation from Robert Gerard that the comments are correct.  
International expert panel sounds like a lot of fun

Mark Kirk, (b)(6) Cell (b)(6)

**From:** robert.gerard@gdfsuez.com <robert.gerard@gdfsuez.com>  
**To:** Kirk, Mark  
**Sent:** Mon Aug 13 12:03:52 2012  
**Subject:** RE: some information

Dear Mark,

Thank you for the information.

The General Director of the Federal Agency of Nuclear Control has effectively said that in an interview on the national radio on Friday morning. The main reason is the number of defects (although according to the latest count we are close now to 9000) concentrated in a relatively small volume (still roughly 1.2 m high on 360° and 120mm thickness).

You must know that FANC wants to constitute a panel of international experts and that the general philosophy in Europe is strongly deterministic, meaning that the probabilistic analysis alone is not an option, we also must demonstrate acceptability acc. to ASME XI App A criteria. Could be a hard task, depending on the hypotheses on material properties. In any case we will have to provide very hard evidence that there is no risk before we can get an authorization to restart.

Best regards

Robert

**From:** Kirk, Mark [mailto:Mark.Kirk@nrc.gov]  
**Sent:** Monday 13 August 2012 15:09  
**To:** Gérard Robert (TRACTEBEL ENGINEERING - BELGIUM)  
**Subject:** some information

Dear Robert –

We found these articles (below) in the popular press, and I thought I would pass them on to you in case you have not seen them. I am particularly curious if you have any insights regarding the comments from FANC (I have them highlighted) **saying that the Doel 3 reactor might not ever re-start**. Is this in your opinion a serious view, or is the quote being taken out of context? If it is serious have you any idea of the justification?

In more mundane matters, the NRC will be sending Bob Hardies of NRR (the regulatory side of our agency ... I am on the research side) to the meeting in Belgium on the 16<sup>th</sup>. In case you have not met Bob, a few particulars:

- Before coming to work for the NRC about 6 years ago Bob had spent over a decade as the chief metallurgist at the Calvert Cliffs NPP in Maryland. He is therefore very well accustomed to what happens in "the real world"

- While with the industry Bob worked extensively with EPRI, industry groups, and ASME. While not a technical specialist he is very well versed with and well aware of structural integrity, materials, and inspection topics.
- Bob is also very well acquainted with PFM and FAVOR as he was my boss in the 2006-2010 timeframe when we were finishing PTS.

Best,

Mark

FYI --

[http://www.marketwatch.com/story/regulators-to-discuss-belgian-reactor-cracks-2012-08-10?reflink=MW\\_news\\_stmp](http://www.marketwatch.com/story/regulators-to-discuss-belgian-reactor-cracks-2012-08-10?reflink=MW_news_stmp)

Aug. 10, 2012, 2:03 p.m. EDT

Regulators to discuss Belgian reactor cracks

By Anna Perez

(Adds background, U.S. regulator's comment.)

European and U.S. nuclear regulators will meet in Brussels next week to discuss possible cracks found in a key component inside a Belgian reactor, in an effort to coordinate response to a problem that may affect several other countries around the world.

"Our technicians and technical staff from other nuclear regulatory bodies in Europe and also the U.S. will attend a meeting on August 16th," a spokesman for Spain's nuclear safety regulator, Consejo de Seguridad Nuclear, said Friday.

Belgian authorities said this week that they were shutting down, at least until the end of the month, one of their seven nuclear plants on the suspicion that the steel vessel holding the reactor core could be cracked. The same component might be present in other power plants in the region and while regulators say the cracks pose no danger, the fact that they appear to stem from a production defect has prompted checks in other countries.

The problem will likely add new controversy to the debate about the safety of atomic energy. After the meltdown at Japan's Fukushima reactor following last year's earthquake and tsunami, the European Union rushed to undertake tests to ensure the safety of its nuclear power plants. Some countries, including the region's largest economy, Germany, decided to speed up their phase-out of nuclear power.

Checks with a new technology at the Doel power plant near Belgium's biggest port, Antwerp, identified the possible cracks, the Belgian regulator FANC said.

The vessel is a 20-centimeter-thick steel tank, which is roughly three meters tall and four meters in diameter.

At least one reactor in Switzerland, another in Belgium and two in Spain have components produced by the same Dutch firm, Rotterdam Drydock Company, which has gone bankrupt since producing the equipment. The U.S. Nuclear Regulatory Commission said Friday it has been informed that 10 American reactors may have used the component in question, but it hasn't yet verified that information with U.S. nuclear operators.

The U.S. regulator said it will send an engineering expert to next week's meeting. "We want to know more about what tests were done, the methodologies and techniques and equipment used to test it," spokesman David McIntyre said. "It's a little early to be jumping to conclusions at this point. There will be more testing to verify that there's a problem and the extent of it."

The Swiss reactor was already shut for routine checks and the second Belgian reactor will be shut next week for tests, the countries' regulators said. Spain didn't find any problem in its vessels, after testing them with the same advanced technology used in Belgium.

Authorities have assured that there are no risks. However, if the cracks are present in sufficient number and size, the reactors might have to be permanently shut down, leaving power generators the challenge of finding alternative sources of electricity.

In Belgium, FANC doubts the Doel 3 reactor, which provides roughly one-sixth of the country's nuclear power, will ever resume operations. "I am pretty skeptical at the moment," Willy De Roovere, the head of FANC, told RTBF radio Friday. "There are many (cracks), and for our taste a bit too many," he added.

Steve Kidd, the deputy director general of the World Nuclear Association, said that it was highly unlikely that there would be radioactive leaks because there is a concrete container around the reactor pressure vessel. However, he add that it wouldn't be possible to continue to operate a reactor with such cracks.

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Ryan Tracy in Washington DC and Selina Williams in London contributed to this article.

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<http://www.france24.com/en/20120810-cracked-belgian-nuclear-reactor-impossible-repair-closed-antwerp-radiation>

latest update: 10/08/2012

- Belgium - nuclear power

Cracked Belgian nuclear reactor to remain closed

A crack discovered in a steel tank containing a nuclear reactor at a Belgian power plant will likely keep the station closed, the country's nuclear safety

agency said on Friday. Repairing the crack is "practically impossible," the agency said.

AP - The head of Belgium's federal agency for nuclear safety AFCN said on Friday he was "sceptical" that an ageing reactor closed over fears of cracks could be restarted.

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According to French-language daily Le Soir, a crack of between 15 and 20 millimetres (0.6 and 0.8 inches) was discovered during a test in June. There has been no denial of this report.

According to the agency, repairs are "practically impossible" and are "not an option" for fear of creating new tensions "which we must avoid at all costs."

Installing a replacement meanwhile has never been attempted anywhere because of the problem of high radiation levels.

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The agency is also mulling the permanent closure "in the worst case" of a second reactor in the country's south near Liege.

The tests showed "faults in the steel base material" on which the reactor vessel is mounted, the AFCN said.

The Dutch firm, Rotterdam Drydocks, that made the vessels is out of business, which has amplified concerns about others it delivered in Europe and in the Americas.

Spain has indicated it has two reactors in the same bracket, Switzerland and Sweden one each.

The firm supplied one to the Netherlands, but had not manufactured it. The government in The Hague said it has still to decide whether to test its nuclear facilities.

The German government said reactors supplied by the defunct company were no longer in service.

Representatives of nuclear safety bodies from all the countries involved will meet in Brussels on August 16 to "exchange information," the AFCN said.

GDF SUEZ Mail Disclaimer: <http://www.gdfsuez.com/disclaimer/disclaimer-fr.html>

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Alley, David

From: Hull, Amy [RES]  
Sent: Thursday, August 16, 2012 7:41 AM  
To: Alley, David  
Subject: as discussed yesterday: Regulators to Discuss DOEL-3 Belgian Reactor Pressure Vessel Cracks

**According to French-language daily Le Soir, a crack of between 15 and 20 millimetres (0.6 and 0.8 inches) was discovered during a test in June.** There has been no denial of this report.

-----Original Message-----

From: (b)(6) [mailto:(b)(6)]  
Sent: Wednesday, August 15, 2012 8:05 PM  
To: Hull, Amy  
Subject: Fw: Regulators to Discuss DOEL-3 Belgian Reactor Pressure Vessel Cracks

Sent via BlackBerry from T-Mobile

-----Original Message-----

From: "Malik, Shah" <Shah.Malik@nrc.gov> [NRK]  
Date: Sun, 12 Aug 2012 19:53:18  
To: RES\_DE\_CIB<RESDECIB@nrc.gov>; RES DE CMB<RESDECMB@nrc.gov>  
Cc: AMY HULL (b)(6)  
Subject: Regulators to Discuss DOEL-3 Belgian Reactor Pressure Vessel Cracks

FYI --

[http://www.marketwatch.com/story/regulators-to-discuss-belgian-reactor-cracks-2012-08-10?reflink=MW\\_news\\_stmp](http://www.marketwatch.com/story/regulators-to-discuss-belgian-reactor-cracks-2012-08-10?reflink=MW_news_stmp)

Aug. 10, 2012, 2:03 p.m. EDT

Regulators to discuss Belgian reactor cracks

By Anna Perez

(Adds background, U.S. regulator's comment.)

European and U.S. nuclear regulators will meet in Brussels next week to discuss possible cracks found in a key component inside a Belgian reactor, in an effort to coordinate response to a problem that may affect several other countries around the world.

"Our technicians and technical staff from other nuclear regulatory bodies in Europe and also the U.S. will attend a meeting on August 16th," a spokesman for Spain's nuclear safety regulator, Consejo de Seguridad Nuclear, said Friday.

Belgian authorities said this week that they were shutting down, at least until the end of the month, one of their seven nuclear plants on the suspicion that the steel vessel holding the reactor core could be cracked. The same component might be present in other power plants

in the region and while regulators say the cracks pose no danger, the fact that they appear to stem from a production defect has prompted checks in other countries.

The problem will likely add new controversy to the debate about the safety of atomic energy. After the meltdown at Japan's Fukushima reactor following last year's earthquake and tsunami, the European Union rushed to undertake tests to ensure the safety of its nuclear power plants. Some countries, including the region's largest economy, Germany, decided to speed up their phase-out of nuclear power.

Checks with a new technology at the Doel power plant near Belgium's biggest port, Antwerp, identified the possible cracks, the Belgian regulator FANC said.

The vessel is a 20-centimeter-thick steel tank, which is roughly three meters tall and four meters in diameter.

At least one reactor in Switzerland, another in Belgium and two in Spain have components produced by the same Dutch firm, Rotterdam Drydock Company, which has gone bankrupt since producing the equipment. The U.S. Nuclear Regulatory Commission said Friday it has been informed that 10 American reactors may have used the component in question, but it hasn't yet verified that information with U.S. nuclear operators.

The U.S. regulator said it will send an engineering expert to next week's meeting. "We want to know more about what tests were done, the methodologies and techniques and equipment used to test it," spokesman David McIntyre said. "It's a little early to be jumping to conclusions at this point. There will be more testing to verify that there's a problem and the extent of it."

The Swiss reactor was already shut for routine checks and the second Belgian reactor will be shut next week for tests, the countries' regulators said. Spain didn't find any problem in its vessels, after testing them with the same advanced technology used in Belgium.

Authorities have assured that there are no risks. However, if the cracks are present in sufficient number and size, the reactors might have to be permanently shut down, leaving power generators the challenge of finding alternative sources of electricity.

In Belgium, FANC doubts the Doel 3 reactor, which provides roughly one-sixth of the country's nuclear power, will ever resume operations. "I am pretty skeptical at the moment," Willy De Roovere, the head of FANC, told RTBF radio Friday. "There are many (cracks), and for our taste a bit too many," he added.

Steve Kidd, the deputy director general of the World Nuclear Association, said that it was highly unlikely that there would be radioactive leaks because there is a concrete container around the reactor pressure vessel. However, he add that it wouldn't be possible to continue to operate a reactor with such cracks.

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Representatives of nuclear safety bodies from all the countries involved will meet in Brussels on August 16 to "exchange information," the AFCN said.



## Failla, David

---

**From:** Davis, Robert  
**Sent:** Thursday, August 16, 2012 9:42 AM  
**To:** Poole, Justin  
**Cc:** Nazario, Tomy; Failla, David  
**Subject:** RE: RPV Stud Holes and ASME Code Questions (LARGE FILE)

I took a quick look at the documents and at this point, I would agree with the license. I will look at it closer next week and let you know my final position. Dave, please call me when you get a chance.

Bob.

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**From:** Poole, Justin  
**Sent:** Thursday, August 16, 2012 9:23 AM  
**To:** Davis, Robert  
**Subject:** FW: RPV Stud Holes and ASME Code Questions (LARGE FILE)

The first attachment has a lot of the background. Thanks.

*Justin C. Poole*  
*Sr. Project Manager*  
*NRR/DORL/LPWB*  
*U.S. Nuclear Regulatory Commission*  
*(301)415-2048*  
*email: [Justin.Poole@nrc.gov](mailto:Justin.Poole@nrc.gov)*

---

**From:** Nazario, Tomy  
**Sent:** Friday, August 10, 2012 3:58 PM  
**To:** Poole, Justin  
**Cc:** Even, Christopher; Baptist, James; Failla, David; Haag, Robert  
**Subject:** RPV Stud Holes and ASME Code Questions (LARGE FILE)

Justin,

As previously discussed and noted below, TVA sleeved three reactor pressure vessel (RPV) stud holes (picture attached as "Document.pdf") during which no NDE was performed. We believe that based on a TIA for Davis Besse issued on October 2011 (Memo 92611 Davis Besse Head Exam-attached) and our initial read of the ASME Code (1971 EDITION-attached) that that NDE should have been performed for the accessible portions of the RPV stud hole.

TVA and Westinghouse have since responded to our concern and have indicated that prior to the work commencing this was evaluated and Westinghouse believed the NDE to not be applicable. They have initiated a problem evaluation report (PER 572414-attached) and included Westinghouse's position (WB2 studholes timeline-attached) which states that "there is no requirement to perform surface examination of the bored holes."

Since there was a previous TIA issued on this subject, NRR Office Instruction COM-106 states that we can discuss this issue via telecom with the appropriate staff and therefore a new TIA may not be necessary. We'd like to engage the staff and get the Code experts and the originator of the TIA to help us better understand whether a violation of NRC and ASME Code requirements exist.

Our questions are as follows:

- 1) Is NB 2500 applicable for the work performed (machining of the RPV stud holes), and if so, should NDE of the accessible portions of the RPV stud holes (similar to NRC staff's position as noted in the TIA) have been performed in accordance with the Code?
- 2) Given that the sleeves have been installed and no NDE was performed, in the staff's opinion, what would be an acceptable means (e.g. engineering evaluation, re-sleeving, etc.) for satisfying these requirements that may not have been met ?

We appreciate any support you could provide. Please note that based on the staff's final position, for this issue, we would consider whether a violation of 50.55a, Codes and Standards exists. Dave Failla has been closely following this issue and is out next week but will be back in the office the week of 8/20. Therefore, we can setup a telecon anytime after 8/20. Thank you.

Tomy

Tomy A. Nazario  
Senior Resident Inspector  
U.S. Nuclear Regulatory Commission

Watts Bar Nuclear Plant  
1260 Nuclear Plant Rd.  
Spring City, TN 37831



Tel: (423) 365-9112  
Cel: (b)(6)  
Fax: (423) 365-9803

E-mail: [Tomy.Nazario@nrc.gov](mailto:Tomy.Nazario@nrc.gov)  
Website: [www.nrc.gov](http://www.nrc.gov)



**From:** Failla, David  
**Sent:** Friday, August 10, 2012 3:03 PM  
**To:** Nazario, Tomy  
**Subject:** RPV Stud Holes

Tomy,

Attached are the documents related to the RPV stud hole surface exams. Our position is Westinghouse/PCI should have performed a surface exam on the stud holes after machining the holes for the threaded inserts. Westinghouse's position is that the code does not require them to do a surface exam. This issue is similar to that discussed in TIA 2011-015 (attached).

David Failla  
U.S. NRC  
Resident Inspector - Watts Bar Unit 2  
(423)365-3964

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Lupold, Timothy

**From:** Cheek, Michael, *MLK*  
**Sent:** Thursday, August 16, 2012 12:14 PM  
**To:** Hardies, Robert; Hiland, Patrick; Rosenberg, Stacey; Lupold, Timothy  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

**From:** Tracy, Glenn *MLK*  
**Sent:** Thursday, August 16, 2012 12:11 PM  
**To:** Boger, Bruce  
**Cc:** Cheek, Michael; Merzke, Daniel  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Thanks so much, Bruce. EDO and Chairman are very interested in this matter and I briefed her yesterday as MJ with preliminary insights and sound Hiland staff information. Please ensure that we keep upper levels well informed and plan for a Chairman and perhaps CA briefing by staff in future and when we know more in coordination with OEDO. Thanks for all you do.

**From:** Boger, Bruce *MLK*  
**Sent:** Thursday, August 16, 2012 9:40 AM  
**To:** Tracy, Glenn; Merzke, Daniel  
**Cc:** Cheek, Michael  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Late breaking information. Unfortunately, I'm not a materials guy, so I can't interpret the results. We'll stay in touch with you, particularly after we hear from Bob Hardies. DE now has the information and will get a head start on the review.

**From:** Thomas, Eric *MLK*  
**Sent:** Thursday, August 16, 2012 9:30 AM  
**To:** Boger, Bruce; Dorman, Dan; McCree, Victor; Hiland, Patrick; Hardies, Robert; Dean, Bill; Casto, Chuck; Collins, Elmo; Brown, Frederick; Leeds, Eric; Evans, Michele  
**Cc:** Nieh, Ho; Lubinski, John; McHale, John; Chernoff, Harold; Garmon, David; Sigmon, Rebecca  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

All,

The attached document contains additional details regarding the indications recently discovered at Doel Unit 3. INPO/WANO has approved distribution of the attachment to NRC-only at this point. Please limit distribution accordingly. My guess is that Bob Hardies will receive this information and more at today's meeting in Belgium.

Any questions feel free to contact me.

Thank you, Eric

*Eric Thomas*  
 U.S. Nuclear Regulatory Commission  
 NRR/DIRS/IOEB  
 OWFN-7E24  
 eric.thomas@nrc.gov

301-415-6772 (office)  
(b)(6) (mobile)

**From:** Boger, Bruce  
**Sent:** Monday, August 13, 2012 2:55 PM  
**To:** Thomas, Eric; Lubinski, John  
**Cc:** Chernoff, Harold  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Thanks Eric. My itch has been scratched—INPO and WANO are aware and working the issue from their perspective.

**From:** Thomas, Eric  
**Sent:** Monday, August 13, 2012 2:36 PM  
**To:** Lubinski, John; Boger, Bruce  
**Cc:** Chernoff, Harold  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Bruce,

I just spoke to my INPO contact. INPO and WANO seem to have the same information as us right now. INPO is looking for any related OpE to share with WANO, but at this point, they don't have anything additional to report.

Eric

*Eric Thomas*  
U.S. Nuclear Regulatory Commission  
NRR/DIRS/IOEB  
OWFN-7E24  
eric.thomas@nrc.gov  
301-415-6772 (office)  
(b)(6) (mobile)

**From:** Lubinski, John  
**Sent:** Monday, August 13, 2012 7:22 AM  
**To:** Thomas, Eric  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

I see that Harold is out and you are acting. Can you please take the lead for this.

**From:** Lubinski, John  
**Sent:** Monday, August 13, 2012 7:20 AM  
**To:** Chernoff, Harold  
**Cc:** Nieh, Ho  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Harold,

Please handle the action below.

**From:** Boger, Bruce  
**Sent:** Monday, August 13, 2012 6:32 AM

**To:** Evans, Michele; Lund, Louise; Coffin, Stephanie; Nieh, Ho; Lubinski, John  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw Indications in Doel 3 Reactor Pressure Vessel

DORL--Please see the email thread below. I'd like the PMs for the sites listed to contact the sites and advise them of the issue and media interest. Thanks.

DIRS--Please have the OpE folks make contact with INPO to see if the INPO/WANO pipeline is working the issue. Thanks.

**From:** McCree, Victor (R11)  
**Sent:** Saturday, August 11, 2012 7:49 AM  
**To:** Boger, Bruce  
**Cc:** Wert, Leonard; Croteau, Rick; Jones, William; Reis, Terrence; Christensen, Harold; Brown, Frederick  
**Subject:** Re: REQUEST: Belgium - Meeting on 8/16 re Flaw Indications in Doel 3 Reactor Pressure Vessel

Thanks Bruce!

---

**From:** Boger, Bruce  
**To:** McCree, Victor; Dorman, Dan  
**Cc:** Johnson, Michael; Wert, Leonard; Leeds, Eric; Brenner, Eliot; Casto, Chuck; Collins, Elmo; Dean, Bill  
**Sent:** Sat Aug 11 07:35:09 2012  
**Subject:** Re: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

I like your thoughts. We'll reach out to the sites that have been identified and NEI. I'm interested in how the international OpE network will address this issue. Will the WANO/INPO system get the word out? Of course, if the issue moves into a technical concern, we'll engage differently. Stay tuned.....thanks for sharing your thoughts.  
Sent from my BlackBerry

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**From:** McCree, Victor  
**To:** Boger, Bruce; Dorman, Dan  
**Cc:** Johnson, Michael; Wert, Leonard; Leeds, Eric; Brenner, Eliot; Casto, Chuck; Collins, Elmo; Dean, Bill  
**Sent:** Fri Aug 10 17:06:48 2012  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Dan/Bruce,

Given the media exposure this issue has already received, and the likelihood for heightened interest in the potential impact on U.S. plants, what's our near term strategy for engaging the affected licensees (and/or NEI)? In my opinion, we should at least let them know that we are aware of the issue and that we plan to send an expert to participate in a regulator-to-regulator meeting next week to learn more.

Your thoughts?

Vic

---

**From:** Boger, Bruce  
**Sent:** Friday, August 10, 2012 4:48 PM  
**To:** McCree, Victor  
**Cc:** Dean, Bill; Lew, David; Wert, Leonard; Dorman, Dan; Hiland, Patrick; Casto, Chuck; Collins, Elmo  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

If you scroll down to the bottom of this email you'll see the initiating request from the Belgium regulator on the Doel situation. We'll know more next week.

**From:** McIntyre, David *DA*  
**Sent:** Friday, August 10, 2012 10:03 AM  
**To:** Burnell, Scott; Hiland, Patrick  
**Cc:** Evans, Michele; Boger, Bruce; Dorman, Dan; Hopkins, Jon; Hardies, Robert; Brenner, Eliot  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Pat – the Dow Jones reporter is asking for details on our “fact finding”. Have we, or will we, ask our licensees on the list whether their RPV’s were from the vendor in question?

Thanks,  
Dave

**From:** Burnell, Scott *DA*  
**Sent:** Friday, August 10, 2012 7:51 AM  
**To:** Hiland, Patrick  
**Cc:** Evans, Michele; Boger, Bruce; Dorman, Dan; McIntyre, David; Hopkins, Jon; Hardies, Robert  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Understood, thanks.

**From:** Hiland, Patrick *DA*  
**Sent:** Friday, August 10, 2012 7:50 AM  
**To:** Burnell, Scott  
**Cc:** Evans, Michele; Boger, Bruce; Dorman, Dan; McIntyre, David; Hopkins, Jon; Hardies, Robert  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

I’m not aware that we’ve done any “independent” verification of the list of plants whose vessels were reportedly made at RDM. However, the list appears to indicate U.S. RPVs that were manufactured in the 60’s and 70’s (may not have been operational till the 90’s). Bob Hardies is NRR/DE’s Senior Level Advisor for Materials and will be on a fact finding mission next Thursday. You should be free to state that one of our experts in the field of Reactor Vessel Materials, has been asked to meet with the Belgian and other regulators next week. As Bruce cautioned, this info is regulator to regulator.

**From:** Burnell, Scott  
**Sent:** Friday, August 10, 2012 7:28 AM  
**To:** Hiland, Patrick; Boger, Bruce; Dorman, Dan; McIntyre, David  
**Cc:** Evans, Michele  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Pat;

Thanks very much, that’s helpful. Have we had the time to verify Electrabel’s list, and how much detail can I share on both that list and Bob’s participation in the meeting? Thanks again.

Scott

**From:** Hiland, Patrick  
**Sent:** Friday, August 10, 2012 7:21 AM  
**To:** Burnell, Scott  
**Cc:** Hiland, Patrick; Cheok, Michael; Terao, David; Nieh, Ho; Lubinski, John; Rosenberg, Stacey; Chernoff, Harold; Dudes, Laura; Luehman, James; Evans, Michele; Dorman, Dan; Holahan, Gary; Bergman, Thomas; Hopkins, Jon; Boger, Bruce  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel  
**Importance:** High

Scott, the below info is pretty clear and it includes a list of U.S. plants (at bottom of string) whose RPVs were manufactured by same vendor. The Belgians have asked 7 countries to attend a meeting next Thursday, August 16, and we're sending Bob Hardies from NRR/DE. This would just be a one-day discussion of what type of NDE techniques were used, where the inspections were performed, etc. Looks like a 2<sup>nd</sup> meeting is being lined up for September.

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**From:** Hiland, Patrick  
**Sent:** Monday, August 06, 2012 11:06 AM  
**To:** Boger, Bruce  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw Indications in Doel 3 Reactor Pressure Vessel  
**Importance:** High

Bruce, I've asked bob Hardies to attend this meeting in response to formal invitation. It's short notice as meeting is next week in Brussels.

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**From:** Hopkins, Jon *NRK*  
**Sent:** Friday, August 03, 2012 9:34 AM  
**To:** Fairbanks, Carolyn; Hardies, Robert  
**Cc:** Roquecruz, Carla; Hiland, Patrick; Chernoff, Harold; Cheok, Michael; McGinty, Tim; Muessle, Mary; Bahadur, Sher; Regan, Christopher; Astwood, Heather; Rodriguez, Veronica; Tehrani, Navid; Sangimino, Donna-Marie; Dehn, Jeff; Fehst, Geraldine; Nieh, Ho; Lubinski, John; Stahl, Eric  
**Subject:** REQUEST: Belgium - Meeting on 8/16 re Flaw Indications in Doel 3 Reactor Pressure Vessel  
**Importance:** High

Carolyn & Bob,

Belgium's regulator, FANC, has invited nuclear regulators from the 7 countries that also have RPVs manufactured by RDM (list below, includes U.S.) to participate in a technical working meeting on Aug. 16 in Brussels to discuss recent UT inspection indications found on the Doel 3 RPV.

France's regulator, ASN, has already responded and said that they would attend ("ASN will participate to this meeting. The representatives will be: Sébastien CROMBEZ Director of the Nuclear pressure Equipment Department and Jean-Luc LACHAUME Deputy Director General.")

Please let me know if we should/can attend this meeting. Note that FANC plans another meeting in Sept. on this issue.

Thank you, Jon

---

**From:** VAN WONTERGHEM Frederik [mailto:Frederik.VANWONTERGHEM@FANC.FGOV.BE]  
**Sent:** Friday, August 03, 2012 5:05 AM  
**To:** Andre-claude.lacoste@asn.fr; jean-luc.lachaume@asn.fr; francois.balestreri@irsn.fr; Sébastien.CROMBEZ@asn.fr; Info@arn.gob.ar; gerald.hennenhoefer@bmu.bund.de; martina.palm@bmu.bund.de; Ulrich.Erven@grs.de; Carla.Schwaeger@grs.de; a.vanlimborgh@mineleni.nl; kees.desbouvrie@minvrom.nl; bert.verweij@minvrom.nl; Roeland.Nieuweboer@minvrom.nl; cmt@csn.es; fjarana@mityc.es; jcb@csn.es; ann-louise.eksborg@ssm.se; Anders.Hallman@ssm.se; Lars.Skanberg@ssm.se; perolof.hagg@ssm.se; p.teri.tilppana@stuk.fi; hans.wanner@ensi.ch; georg.schwarz@ensi.ch; markus.straub@ensi.ch; d.umar.kalkhof@ensi.ch; Hopkins, Jon; Kirk, Mark; Hardies, Robert; Collins, Jay  
**Cc:** VERTELAERS An; SCHRAUBEN Manfred; DE ROOVERE Willy; TOMBUYES Beatrice; pierre.barras@belv.be; pierre.briegleb@belv.be; benoit.deboeck@belv.be; aweyn@vincotte.be; hvandriessche@vincotte.be  
**Subject:** URGENT Message on Nuclear Safety: Flaw indications in Doel 3 Reactor Pressure Vessel

Dear all,

This week, a preliminary IRS Incident Report was published by Belgium related to the detection of a large number of flaw indications in the reactor pressure vessel of Doel 3 (PWR - Framatome Design). (Reference IRS Number 8244: "FLAWS INDICATIONS IN THE REACTOR PRESSURE VESSEL"). In attachment you can find a copy of this IRS report.

As indicated in the IRS report, the Doel 3 NPP outage has been extended to allow further inspections and to perform additional studies by the licensee to analyze and, if possible, to validate and confirm the structural integrity of the vessel. At the moment, the licensee supposes that the flaw indications were already present at the moment of forging of the vessel, which was done by Rotterdam Droogdok Maatschappij (also referred to as Rotterdam Dockyards or RDM). Both a deterministic approach (in accordance with ASME XI Appendix A) and a probabilistic approach (in accordance with 10CFR50.61a) are being considered by the licensee to justify the structural integrity of the reactor vessel.

Some additional information on the types of flaw indications and other possible reactor vessels forged by this company can be found below.

Considering the potential consequences of this event, the Belgian regulatory body would like to organise on short notice a technical working meeting in Brussels on this issue for those regulatory bodies which could be interested by these findings, specifically those regulatory bodies of countries where RPVs forged by RDM can be present. During this technical working meeting, additional information on the results found at Doel 3 NPP and the on-going licensee investigations and calculations will be made available by the Belgian regulatory body (FANC, its technical support organisation Bel V and the Authorized Inspection Authority AIB Vinçotte International). In addition, a roundtable discussion between regulatory bodies will be held to discuss relevant experiences with this kind of inspections and flaw indications. Specific topics/questions to be discussed during this roundtable discussion are mentioned in an email by Bel V which was sent last week (see attachment). We are especially interested to know if this type of ISI was already performed in your countries on the reactor vessels forged by this company, and if so, what the results have been. May we kindly invite every country to present additional available input and thoughts to our working meeting.

**This technical working meeting shall take place in Brussels (FANC offices, Ravensteinstraat 36, 1000 Brussels) on Thursday 16 August between 10h00 and 16h00.**

We would be very grateful if one or more technical experts of your organisation could be present during this working meeting.

To confirm your participation, please send me a reply by email to [frederik.vanwonderghem@fanc.fgov.be](mailto:frederik.vanwonderghem@fanc.fgov.be) (tel. ++32 2 289 2082) before Friday 10 August.

If you have further technical questions on this event, you can contact [pierre.briegleb@belv.be](mailto:pierre.briegleb@belv.be) (tel ++32 2 528 0245).

A second technical working meeting could be held in the near future (presumably early September) to discuss the available results of the additional inspections at Tihange 2 and the results of the licensee investigations and calculations aiming to confirm the structural integrity of the reactor vessel. Further actions in your countries can also be discussed during this second meeting. We will inform you as soon as possible of the timing of this second working meeting.

Best regards,

Frederik Van Wonderghem

Department of Nuclear Facilities and Waste  
Federal Agency for Nuclear Control  
Ravensteinstraat 36, 1000 Brussel, Belgium  
[www.fanc.fgov.be](http://www.fanc.fgov.be)  
Tel.: +32 (0)2 289 20 82  
Fax: +32 (0)2 289 21 12



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1

- Reactor Pressel Vessels forged by Rotterdam Droogdok Maatschappij (also referred to as Rotterdam Dockyards or RDM)

- |                                    |      |   |      |      |           |
|------------------------------------|------|---|------|------|-----------|
| Atucha 1                           | PHWR |   | 335  | 1980 | Siemens   |
| Doel 3                             | PWR  | 3 | 1000 | 1982 | Framator  |
| Tihange 2                          | PWR  | 3 | 1000 | 1982 | Framator  |
| Brünsbittel                        | BWR  | - | 770  | 1977 | KWU       |
| Philippsburg 1                     | BWR  |   | 890  | 1980 | KWU       |
| Dodewaard                          | BWR  | - | 52   | 1968 | RDM       |
| Borssele                           | PWR  | 2 | 515  | 1973 | KWU       |
| S <sup>ta</sup> Maria de<br>Garona | BWR  |   | 450  | 1971 | General E |
| Cofrentes                          | BWR  | - | 1064 | 1984 | General E |
| Rijnghals 2                        | PWR  | 3 | 813  | 1974 | Westingh  |
| Leibstadt                          | BWR  | - | 1165 | 1984 | General E |
| Mühleberg                          | BWR  | - | 373  | 1971 | General E |
| Catawba 1                          | PWR  | 4 | 1129 | 1985 | Westingh  |
| McGuire 2                          | PWR  | 4 | 1100 | 1983 | Westingh  |
| North Anna 1                       | PWR  | 3 | 903  | 1978 | Westingh  |
| North Anna 2                       | PWR  | 3 | 973  | 1980 | Westingh  |
| Quad Cities 1                      | BWR  | - | 882  | 1972 | General E |
| Sequoyah 1                         | PWR  | 4 | 1162 | 1980 | Westingh  |
| Sequoyah 2                         | PWR  | 4 | 1126 | 1981 | Westingh  |
| Surry 1                            | PWR  | 3 | 839  | 1972 | Westingh  |
| Surry 2                            | PWR  | 3 | 800  | 1973 | Westingh  |
| Watts Bar 1                        | PWR  | 4 | 1123 | 1996 | Westingh  |

**FANC AFCN**

$$\begin{aligned}
 \mathbb{E}[\mathcal{L}_t] &= \mathbb{E}[\mathcal{L}_t^{\text{train}} + \mathcal{L}_t^{\text{val}}] = \mathbb{E}[\mathcal{L}_t^{\text{train}}] + \mathbb{E}[\mathcal{L}_t^{\text{val}}] \\
 &= \mathbb{E}[\mathcal{L}_t^{\text{train}}] + \mathbb{E}[\mathcal{L}_t^{\text{val}}] = \mathbb{E}[\mathcal{L}_t^{\text{train}}] + \mathbb{E}[\mathcal{L}_t^{\text{val}}]
 \end{aligned}$$

Het FANC is ISO 9001:2008 gecertificeerd – L'AFCN est certifiée ISO 9001:2008.

Aub, denk aan het milieu voordat u deze mail uitprint  
Svť, pensez à notre environnement avant d'imprimer ce mail.

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149

**Alley, David**

**From:** Hiland, Patrick *ml*  
**Sent:** Thursday, August 16, 2012 9:51 AM  
**To:** Lupold, Timothy; Cumblidge, Stephen; Alley, David  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel  
**Attachments:** image001.gif; Technical Information concerning Reactor Vessel Doel 3[1].pdf

fyi

**From:** Thomas, Eric *ml*  
**Sent:** Thursday, August 16, 2012 9:30 AM  
**To:** Boger, Bruce; Dorman, Dan; McCree, Victor; Hiland, Patrick; Hardies, Robert; Dean, Bill; Casto, Chuck; Collins, Elmo; Brown, Frederick; Leeds, Eric; Evans, Michele  
**Cc:** Nieh, Ho; Lubinski, John; McHale, John; Chernoff, Harold; Garmon, David; Sigmon, Rebecca  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

All,

The attached document contains additional details regarding the indications recently discovered at Doel Unit 3. INPO/WANO has approved distribution of the attachment to NRC-only at this point. Please limit distribution accordingly. My guess is that Bob Hardies will receive this information and more at today's meeting in Belgium.

Any questions feel free to contact me.

Thank you, Eric

*Eric Thomas*  
U.S. Nuclear Regulatory Commission  
NRR/DIRS/IOEB  
OWFN-7E24  
eric.thomas@nrc.gov  
301-415-6772 (office)

(b)(6)

**From:** Boger, Bruce *ml*  
**Sent:** Monday, August 13, 2012 2:55 PM  
**To:** Thomas, Eric; Lubinski, John  
**Cc:** Chernoff, Harold  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Thanks Eric. My itch has been scratched—INPO and WANO are aware and working the issue from their perspective.

**From:** Thomas, Eric  
**Sent:** Monday, August 13, 2012 2:36 PM  
**To:** Lubinski, John; Boger, Bruce  
**Cc:** Chernoff, Harold  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Bruce,

B/128

I just spoke to my INPO contact. INPO and WANO seem to have the same information as us right now. INPO is looking for any related OpE to share with WANO, but at this point, they don't have anything additional to report.

Eric

*Eric Thomas*

U.S. Nuclear Regulatory Commission  
NRR/DIRS/IOEB  
OWFN-7E24  
eric.thomas@nrc.gov  
301-415-6772 (office)

(b)(6)

**From:** Lubinski, John *NR*  
**Sent:** Monday, August 13, 2012 7:22 AM  
**To:** Thomas, Eric  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

I see that Harold is out and you are acting. Can you please take the lead for this.

**From:** Lubinski, John  
**Sent:** Monday, August 13, 2012 7:20 AM  
**To:** Chernoff, Harold  
**Cc:** Nieh, Ho  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Harold,

Please handle the action below.

**From:** Boger, Bruce  
**Sent:** Monday, August 13, 2012 6:32 AM  
**To:** Evans, Michele; Lund, Louise; Coffin, Stephanie; Nieh, Ho; Lubinski, John  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

DORL--Please see the email thread below. I'd like the PMs for the sites listed to contact the sites and advise them of the issue and media interest. Thanks.

DIRS--Please have the OpE folks make contact with INPO to see if the INPO/WANO pipeline is working the issue. Thanks.

**From:** McCree, Victor *RV*  
**Sent:** Saturday, August 11, 2012 7:49 AM  
**To:** Boger, Bruce  
**Cc:** Wert, Leonard; Croteau, Rick; Jones, William; Rels, Terrence; Christensen, Harold; Brown, Frederick  
**Subject:** Re: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Thanks Bruce!

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**From:** Boger, Bruce  
**To:** McCree, Victor; Dorman, Dan  
**Cc:** Johnson, Michael; Wert, Leonard; Leeds, Eric; Brenner, Eliot; Casto, Chuck; Collins, Elmo; Dean, Bill

**Sent:** Sat Aug 11 07:35:09 2012

**Subject:** Re: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

I like your thoughts. We'll reach out to the sites that have been identified and NEI. I'm interested in how the international OpE network will address this issue. Will the WANO/INPO system get the word out? Of course, if the issue moves into a technical concern, we'll engage differently. Stay tuned.....thanks for sharing your thoughts.  
Sent from my BlackBerry

---

**From:** McCree, Victor

**To:** Boger, Bruce; Dorman, Dan

**Cc:** Johnson, Michael; Wert, Leonard; Leeds, Eric; Brenner, Eliot; Casto, Chuck; Collins, Elmo; Dean, Bill

**Sent:** Fri Aug 10 17:06:48 2012

**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Dan/Bruce,

Given the media exposure this issue has already received, and the likelihood for heightened interest in the potential impact on U.S. plants, what's our near term strategy for engaging the affected licensees (and/or NEI)? In my opinion, we should at least let them know that we are aware of the issue and that we plan to send an expert to participate in a regulator-to-regulator meeting next week to learn more.

Your thoughts?

Vic

**From:** Boger, Bruce

**Sent:** Friday, August 10, 2012 4:48 PM

**To:** McCree, Victor

**Cc:** Dean, Bill; Lew, David; Wert, Leonard; Dorman, Dan; Hiland, Patrick; Casto, Chuck; Collins, Elmo

**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

If you scroll down to the bottom of this email you'll see the initiating request from the Belgium regulator on the Doel situation. We'll know more next week.

**From:** McIntyre, David 

**Sent:** Friday, August 10, 2012 10:03 AM

**To:** Burnell, Scott; Hiland, Patrick

**Cc:** Evans, Michele; Boger, Bruce; Dorman, Dan; Hopkins, Jon; Hardies, Robert; Brenner, Eliot

**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Pat – the Dow Jones reporter is asking for details on our “fact finding”. Have we, or will we, ask our licensees on the list whether their RPV's were from the vendor in question?

Thanks,

Dave

**From:** Burnell, Scott

**Sent:** Friday, August 10, 2012 7:51 AM

**To:** Hiland, Patrick

**Cc:** Evans, Michele; Boger, Bruce; Dorman, Dan; McIntyre, David; Hopkins, Jon; Hardies, Robert

**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Understood, thanks.

**From:** Hiland, Patrick  
**Sent:** Friday, August 10, 2012 7:50 AM  
**To:** Burnell, Scott  
**Cc:** Evans, Michele; Boger, Bruce; Dorman, Dan; McIntyre, David; Hopkins, Jon; Hardies, Robert  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

I'm not aware that we've done any "independent" verification of the list of plants whose vessels were reportedly made at RDM. However, the list appears to indicate U.S. RPVs that were manufactured in the 60's and 70's (may not have been operational till the 90's). Bob Hardies is NRR/DE's Senior Level Advisor for Materials and will be on a fact finding mission next Thursday. You should be free to state that one of our experts in the field of Reactor Vessel Materials, has been asked to meet with the Belgian and other regulators next week. As Bruce cautioned, this info is regulator to regulator.

**From:** Burnell, Scott  
**Sent:** Friday, August 10, 2012 7:28 AM  
**To:** Hiland, Patrick; Boger, Bruce; Dorman, Dan; McIntyre, David  
**Cc:** Evans, Michele  
**Subject:** RE: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel

Pat;

Thanks very much, that's helpful. Have we had the time to verify Electrabel's list, and how much detail can I share on both that list and Bob's participation in the meeting? Thanks again.

Scott

**From:** Hiland, Patrick  
**Sent:** Friday, August 10, 2012 7:21 AM  
**To:** Burnell, Scott  
**Cc:** Hiland, Patrick; Cheok, Michael; Terao, David; Nieh, Ho; Lubinski, John; Rosenberg, Stacey; Chernoff, Harold; Dudes, Laura; Luehman, James; Evans, Michele; Dorman, Dan; Holahan, Gary; Bergman, Thomas; Hopkins, Jon; Boger, Bruce  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel  
**Importance:** High

Scott, the below info is pretty clear and it includes a list of U.S. plants (at bottom of string) whose RPVs were manufactured by same vendor. The Belgians have asked 7 countries to attend a meeting next Thursday, August 16, and we're sending Bob Hardies from NRR/DE. This would just be a one-day discussion of what type of NDE techniques were used, where the inspections were performed, etc. Looks like a 2<sup>nd</sup> meeting is being lined up for September.

**From:** Hiland, Patrick  
**Sent:** Monday, August 06, 2012 11:06 AM  
**To:** Boger, Bruce  
**Subject:** FW: REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel  
**Importance:** High

Bruce, I've asked bob Hardies to attend this meeting in response to formal invitation. It's short notice as meeting is next week in Brussels.

**From:** Hopkins, Jon   
**Sent:** Friday, August 03, 2012 9:34 AM  
**To:** Fairbanks, Carolyn; Hardies, Robert  
**Cc:** Roquecruz, Carla; Hiland, Patrick; Chernoff, Harold; Cheok, Michael; McGinty, Tim; Muessle, Mary; Bahadur,

Sher; Regan, Christopher; Astwood, Heather; Rodriguez, Veronica; Tehrani, Navid; Sangimino, Donna-Marie; Dehn, Jeff; Fehst, Geraldine; Nieh, Ho; Lubinski, John; Stahl, Eric  
**Subject:** REQUEST: Belgium - Meeting on 8/16 re Flaw indications in Doel 3 Reactor Pressure Vessel  
**Importance:** High

Carolyn & Bob,

Belgium's regulator, FANC, has invited nuclear regulators from the 7 countries that also have RPVs manufactured by RDM (list below, includes U.S.) to participate in a technical working meeting on Aug. 16 in Brussels to discuss recent UT inspection indications found on the Doel 3 RPV.

France's regulator, ASN, has already responded and said that they would attend ("ASN will participate to this meeting. The representatives will be: Sébastien CROMBEZ Director of the Nuclear pressure Equipment Department and Jean-Luc LACHAUME Deputy Director General.")

Please let me know if we should/can attend this meeting. Note that FANC plans another meeting in Sept. on this issue.

Thank you, Jon

**From:** VAN WONTERGHEM Frederik [mailto:Frederik.VANWONTERGHEM@FANC.FGOV.BE]

**Sent:** Friday, August 03, 2012 5:05 AM

**To:** Andre-claude.lacoste@asn.fr; jean-luc.lachaume@asn.fr; francois.balestreri@irsn.fr; Sebastien.CROMBEZ@asn.fr; info@arn.gob.ar; gerald.hennenhoefer@bmu.bund.de; martina.palm@bmu.bund.de; Ulrich.Erven@grs.de; Carla.Schwaeger@grs.de; a.vanlimborgh@mineleni.nl; kees.desbouvrie@minvrom.nl; bert.verwelj@minvrom.nl; Roeland.Nieuweboer@minvrom.nl; cmt@csn.es; fjarana@mityc.es; jcb@csn.es; ann-louise.eksborg@ssm.se; Anders.Hallman@ssm.se; Lars.Skanberg@ssm.se; perolof.hagg@ssm.se; petteri.tiippana@stuk.fi; hans.wanner@ensi.ch; georg.schwarz@ensi.ch; markus.straub@ensi.ch; dietmar.Kalkhof@ensi.ch; Hopkins, Jon; Kirk, Mark; Hardies, Robert; Collins, Jay  
**Cc:** WERTELAERS An; SCHRAUBEN Manfred; DE ROOVERE Willy; TOMBUYES Beatrice; pierre.barras@belv.be; pierre.briegleb@belv.be; benoit.deboeck@belv.be; aweyn@vincotte.be; hvandriessche@vincotte.be  
**Subject:** URGENT Message on Nuclear Safety: Flaw indications in Doel 3 Reactor Pressure Vessel

Dear all,

This week, a preliminary IRS Incident Report was published by Belgium related to the detection of a large number of flaw indications in the reactor pressure vessel of Doel 3 (PWR - Framatome Design). (Reference IRS Number 8244: "FLAWS INDICATIONS IN THE REACTOR PRESSURE VESSEL"). In attachment you can find a copy of this IRS report.

As indicated in the IRS report, the Doel 3 NPP outage has been extended to allow further inspections and to perform additional studies by the licensee to analyze and, if possible, to validate and confirm the structural integrity of the vessel. At the moment, the licensee supposes that the flaw indications were already present at the moment of forging of the vessel, which was done by Rotterdam Droogdok Maatschappij (also referred to as Rotterdam Dockyards or RDM). Both a deterministic approach (in accordance with ASME XI Appendix A) and a probabilistic approach (in accordance with 10CFR50.61a) are being considered by the licensee to justify the structural integrity of the reactor vessel.

Some additional information on the types of flaw indications and other possible reactor vessels forged by this company can be found below.

Considering the potential consequences of this event, the Belgian regulatory body would like to organise on short notice a technical working meeting in Brussels on this issue for those regulatory bodies which could be interested by these findings, specifically those regulatory bodies of countries where RPVs forged by RDM can be present. During this technical working meeting, additional information on the results found at Doel 3 NPP and the on-going licensee investigations and calculations will be made available by the Belgian regulatory body (FANC, its

technical support organisation Bel V and the Authorized Inspection Authority AIB Vinçotte International). In addition, a roundtable discussion between regulatory bodies will be held to discuss relevant experiences with this kind of inspections and flaw indications. Specific topics/questions to be discussed during this roundtable discussion are mentioned in an email by Bel V which was sent last week (see attachment). We are especially interested to know if this type of ISI was already performed in your countries on the reactor vessels forged by this company, and if so, what the results have been. May we kindly invite every country to present additional available input and thoughts to our working meeting .

**This technical working meeting shall take place in Brussels (FANC offices, Ravensteinstraat 36, 1000 Brussels) on Thursday 16 August between 10h00 and 16h00.**

We would be very grateful if one or more technical experts of your organisation could be present during this working meeting.

To confirm your participation, please send me a reply by email to [frederik.vanwonderghem@fanc.fgov.be](mailto:frederik.vanwonderghem@fanc.fgov.be) (tel. ++32 2 289 2082) before Friday 10 August.

If you have further technical questions on this event, you can contact [pierre.briegleb@belv.be](mailto:pierre.briegleb@belv.be) (tel ++32 2 528 0245).

A second technical working meeting could be held in the near future (presumably early September) to discuss the available results of the additional inspections at Tihange 2 and the results of the licensee investigations and calculations aiming to confirm the structural integrity of the reactor vessel. Further actions in your countries can also be discussed during this second meeting. We will inform you as soon as possible of the timing of this second working meeting.

Best regards,

Frederik Van Wonderghem

Department of Nuclear Facilities and Waste  
Federal Agency for Nuclear Control  
Ravensteinstraat 36, 1000 Brussel, Belgium  
[www.fanc.fgov.be](http://www.fanc.fgov.be)  
Tel.: +32 (0)2 289 20 82  
Fax: +32 (0)2 289 21 12

#### **Additional information on the types of flaw indications and other possible reactor vessels**

##### Preliminary results from additional inspections

- o As described in the IRS message, considering the limitations of the inspection method which revealed the presence of those defects, an inspection of the whole height of the RPV with the UT-qualified method used to control the beltline welds has subsequently been performed. This inspection covers the whole thickness and the whole height of the RPV of Doel 3.
- o The preliminary results from those additional inspections confirm the presence of several thousand (up to 10000) flaw indications in the reactor vessel base material. These flaw indications seem to be laminar in shape and have average diameters of 25 mm.

##### Reactor Pressurized Vessels forged by Rotterdam Droogdok Maatschappij (also referred to as Rotterdam Dockyards or RDM)

- o The Doel 3 and Tihange 2 RPVs were forged by RDM, which according to the Licensee Electrabel provided some 20+ vessels in Europe and the US.
- o The table below gives an overview of these RPVs (this list has been established by the licensee and could contain errors or omissions).





|                                |      |   |      |      |            |
|--------------------------------|------|---|------|------|------------|
| Atucha 1                       | PHWR |   | 335  | 1980 | Siemens    |
| Doel 3                         | PWR  | 3 | 1000 | 1982 | Framatom   |
| Tihange 2                      | PWR  | 3 | 1000 | 1982 | Framatom   |
| Brünsbittel                    | BWR  | - | 770  | 1977 | KWU        |
| Philippsburg 1                 | BWR  |   | 890  | 1980 | KWU        |
| Dodewaard                      | BWR  | - | 52   | 1968 | RDM        |
| Borssele                       | PWR  | 2 | 515  | 1973 | KWU        |
| S <sup>a</sup> Maria de Garona | BWR  |   | 450  | 1971 | General El |
| Cofrentes                      | BWR  | - | 1064 | 1984 | General El |
| Ringhals 2                     | PWR  | 3 | 813  | 1974 | Westinghc  |
| Leibstadt                      | BWR  | - | 1165 | 1984 | General El |
| Mühleberg                      | BWR  | - | 373  | 1971 | General El |
| Catawba 1                      | PWR  | 4 | 1129 | 1985 | Westinghc  |
| McGuire 2                      | PWR  | 4 | 1100 | 1983 | Westinghc  |
| North Anna 1                   | PWR  | 3 | 903  | 1978 | Westinghc  |
| North Anna 2                   | PWR  | 3 | 973  | 1980 | Westinghc  |
| Quad Cities 1                  | BWR  | - | 882  | 1972 | General El |
| Sequoyah 1                     | PWR  | 4 | 1162 | 1980 | Westinghc  |
| Sequoyah 2                     | PWR  | 4 | 1126 | 1981 | Westinghc  |
| Surry 1                        | PWR  | 3 | 839  | 1972 | Westinghc  |
| Surry 2                        | PWR  | 3 | 800  | 1973 | Westinghc  |
| Watts Bar 1                    | PWR  | 4 | 1123 | 1996 | Westinghc  |

## FANC & AFCN

Belgium - België - Belgique - Belgien - Belgica - Belgien

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N.b. réfléchissez à votre environnement avant d'imprimer ce mail

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16a.

Alley, David

**From:** Hardies, Robert *NR*  
**Sent:** Friday, August 17, 2012 10:28 AM  
**To:** Hilland, Patrick; Cheok, Michael; Case, Michael; Kirk, Mark; Alley, David; Rosenberg, Stacey  
**Subject:** Fw: Doel 3 RPV Working meeting August 16: Handouts & Start-up of working groups  
**Attachments:** FANC\_LOGO.gif; 2012-08-16 Doel 3 workshop §2 Presentation EBL -handout.pdf; 2012-08-16 Doel 3 workshop §3 Regulatory Body approach.pdf; 2012-08-16 Doel 3 workshop §5 Results question list.pdf; 2012-08-16 Doel 3 workshop Agenda + §1 Introduction.pdf

Please do not forward outside of NRC.

Attached you should find the presentation from FANC and Tractabel regarding the indications at Doel 3. I also prepared a brief summary that I sent yesterday to a slightly different distribution. I am using a blackberry so I am not exactly sure what the attachments contain, but during the meeting the handouts did not contain all of the slides. These files may be like the handouts.

Sent from my NRC Blackberry  
Bob Hardies

(b)(6)

**From:** VAN WONTERGHEM Frederik <Frederik.VANWONTERGHEM@FANC.FGOV.BE>  
**To:** jean-luc.lachaume@asn.fr <jean-luc.lachaume@asn.fr>; francois.balestreri@irsn.fr <francois.balestreri@irsn.fr>; Sebastien.CROMBEZ@asn.fr <Sebastien.CROMBEZ@asn.fr>; Klaus.Germerdonk@ensi.ch <Klaus.Germerdonk@ensi.ch>; Ryf Martin <Martin.Ryf@ensi.ch>; Hardies, Robert; lutz.lindhorst@ilent.nl <lutz.lindhorst@ilent.nl>; Wiel, ir. L. van der <L.vanderWiel@mineleni.nl>; C.Hoogwerf@mineleni.nl <C.Hoogwerf@mineleni.nl>; erik.zeelenberg@lr.org <erik.zeelenberg@lr.org>; Thomas.Schimpfke@grs.de <Thomas.Schimpfke@grs.de>; Mihdi.Elmas@grs.de <Mihdi.Elmas@grs.de>; bsf@csn.es <bsf@csn.es>; stephen.druce@hse.gsi.gov.uk <stephen.druce@hse.gsi.gov.uk>; Richard.Sundberg@ssm.se <Richard.Sundberg@ssm.se>; benoit.zerger@ec.europa.eu <benoit.zerger@ec.europa.eu>; Bernhard.ELSING@ec.europa.eu <Bernhard.ELSING@ec.europa.eu>  
**Cc:** WERTELAERS An <An.WERTELAERS@FANC.FGOV.BE>; SCHRAUBEN Manfred <Manfred.SCHRAUBEN@FANC.FGOV.BE>; DE ROOVERE Willy <Willy.DEROOVERE@FANC.FGOV.BE>; TOMBUYES Beatrice <Beatrice.TOMBUYES@FANC.FGOV.BE>; OULIDDREN Kamreddine <Kamreddine.OULIDDREN@FANC.FGOV.BE>; pierre.barras@belv.be <pierre.barras@belv.be>; pierre.briegleb@belv.be <pierre.briegleb@belv.be>; henri.drymael@belv.be <henri.drymael@belv.be>; simon.hoebeeck@belv.be <simon.hoebeeck@belv.be>; Tang Tchien Minh <tchienminh.tang@belv.be>; Deledicque Vincent <vincent.deledicque@belv.be>; Deprez Marc <marc.deprez@belv.be>; aweyn@vincotte.be <aweyn@vincotte.be>; hvandriessche@vincotte.be <hvandriessche@vincotte.be>; william.dhaeseleer@mech.kuleuven.be <william.dhaeseleer@mech.kuleuven.be>  
**Sent:** Fri Aug 17 06:57:38 2012  
**Subject:** Doel 3 RPV Working meeting August 16: Handouts & Start-up of working groups

Dear all,

On behalf of the Belgian regulatory authorities (FANC, Bel V and AIB-Vincotte) I would like to thank you all for your active participation to the working meeting we had yesterday on the Doel 3 RPV issue.

In attachment you can find an electronic version of the handouts of the presentations that were given yesterday. As discussed during the meeting, we would like to ask you to handle this information with the necessary confidentiality and to not distribute them outside your regulatory bodies.

Should you have any further (technical) questions or clarifications on some of the topics discussed, please contact either myself or mr. Pierre Briegleb ([pierre.briegleb@belv.be](mailto:pierre.briegleb@belv.be) ; tel ++32 2 528 0245).

At the end of the meeting the start-up of 3 expert working groups was discussed.

R

Below you can find the candidate countries which intended to participate to these working groups.

May I ask you kindly as soon as possible to confirm your willingness to participate in these working group by sending me the following information for participants from your organisation for each working group: name, organisation, function, email & phone , area of expertise.

We'll give you as soon as possible additional information on how these working groups will function (documents to be discussed, ...)

- Working group 1 : Non-destructive Examination techniques : Belgium, Netherlands, United States, France, United Kingdom, EU Clearinghouse
- Working group 2: Structural mechanics & fracture mechanics – Approach for justification file: Belgium, Netherlands, United States, France, Germany, Spain, (Switzerland), (United Kingdom)
- Working group 3: Metallurgical origin / root causes of the flaw indications: Belgium, United States, France, Germany, (United Kingdom)

Best regards,

Frederik Van Wouterghem

FEDERAL AGENCY FOR NUCLEAR CONTROL

Ravensteinstraat 36, 1000 Brussel

[www.fanc.fgov.be](http://www.fanc.fgov.be)

Tel.: +32 (0)2 289 20 82

Fax: +32 (0)2 289 21 12

**FANC & AFCN**

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The sender of the e-mail message accepts the responsibility for the content of the message.

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## Failla, David

---

**From:** Davis, Robert  
**Sent:** Tuesday, August 21, 2012 9:01 AM  
**To:** Rosenberg, Stacey  
**Cc:** Manoly, Kamal; Failla, David; Cheruvenki, Ganesh; Terao, David; Poole, Justin  
**Subject:** FW: RPV Stud Holes and ASME Code Questions (LARGE FILE)  
**Attachments:** WB2\_studholes\_timeline-July26 122220610.pdf; TICKET-WBC-PROBLEM-572414.pdf; 1971 EDITION - SUBSECTION NB.pdf; Code Int III-77-162.pdf; Memo 92611 Davis Besse Head Exam TIA\_Final.docx; Document.pdf

Stacey,

I received the below e-mail from NRR DORL regarding some inspection issues at Watts Bar. Although I am the NRC representative for the Section III Subgroup on materials, fabrication and examination, the final decision on matters such as the RPV bolt hole examination in the attached referenced material is NRRs responsibility. I talked to Ganesh this morning and filled him in on the issue. I talked to Dave Failla from the region at Watts Bar yesterday regarding this issue. Given what I know at this point, I don't believe that they violated 1971 Edition the code. However, I have not looked at all of the information in depth and the final decision on whether they violated the Code or not should come from NRR. I told Ganesh that if needs any assistance or has any questions to feel free to call me.

Thanks,  
Bob

Robert H. Davis  
Senior Materials Engineer  
Component Integrity, Performance, & Testing Branch 2  
Division of Engineering  
Office of New Reactors  
Office Location - T-10H02  
Mail Stop T-10K07

301-415-4028 (voice)  
301-415-5160 (fax)  
[robert.davis@nrc.gov](mailto:robert.davis@nrc.gov)

---

**From:** Poole, Justin  
**Sent:** Thursday, August 16, 2012 9:23 AM  
**To:** Davis, Robert  
**Subject:** FW: RPV Stud Holes and ASME Code Questions (LARGE FILE)

The first attachment has a lot of the background. Thanks.

Justin C. Poole  
Sr. Project Manager  
NRR/DORL/LPWB  
U.S. Nuclear Regulatory Commission  
(301)415-2048  
email: [Justin.Poole@nrc.gov](mailto:Justin.Poole@nrc.gov)

---

**From:** Nazario, Tomy  
**Sent:** Friday, August 10, 2012 3:58 PM

B/110

**To:** Poole, Justin  
**Cc:** Even, Christopher; Baptist, James; Failla, David; Haag, Robert  
**Subject:** RPV Stud Holes and ASME Code Questions (LARGE FILE)

Justin,

As previously discussed and noted below, TVA sleeved three reactor pressure vessel (RPV) stud holes (picture attached as "Document.pdf") during which no NDE was performed. We believe that based on a TIA for Davis Besse issued on October 2011 (Memo 92611 Davis Besse Head Exam-attached) and our initial read of the ASME Code (1971 EDITION-attached) that that NDE should have been performed for the accessible portions of the RPV stud hole.

TVA and Westinghouse have since responded to our concern and have indicated that prior to the work commencing this was evaluated and Westinghouse believed the NDE to not be applicable. They have initiated a problem evaluation report (PER 572414-attached) and included Westinghouse's position (WB2 studholes timeline-attached) which states that "there is no requirement to perform surface examination of the bored holes."

Since there was a previous TIA issued on this subject, NRR Office Instruction COM-106 states that we can discuss this issue via telecom with the appropriate staff and therefore a new TIA may not be necessary. We'd like to engage the staff and get the Code experts and the originator of the TIA to help us better understand whether a violation of NRC and ASME Code requirements exist.

Our questions are as follows:

- 1) Is NB 2500 applicable for the work performed (machining of the RPV stud holes), and if so, should NDE of the accessible portions of the RPV stud holes (similar to NRC staff's position as noted in the TIA) have been performed in accordance with the Code?
- 2) Given that the sleeves have been installed and no NDE was performed, in the staff's opinion, what would be an acceptable means (e.g. engineering evaluation, re-sleeving, etc.) for satisfying these requirements that may not have been met?

We appreciate any support you could provide. Please note that based on the staff's final position, for this issue, we would consider whether a violation of 50.55a, Codes and Standards exists. Dave Failla has been closely following this issue and is out next week but will be back in the office the week of 8/20. Therefore, we can setup a telecon anytime after 8/20. Thank you.

Tomy

**Tomy A. Nazario**  
Senior Resident Inspector  
U.S. Nuclear Regulatory Commission

Watts Bar Nuclear Plant  
1260 Nuclear Plant Rd.  
Spring City, TN 37831



Tel: (423) 365-9112  
Cel: (b)(6)  
Fax: (423) 365-9803

E-mail: [Tomy.Nazario@nrc.gov](mailto:Tomy.Nazario@nrc.gov)  
Website: [www.nrc.gov](http://www.nrc.gov)



---

**From:** Failla, David  
**Sent:** Friday, August 10, 2012 3:03 PM  
**To:** Nazario, Tomy  
**Subject:** RPV Stud Holes

Tomy,

Attached are the documents related to the RPV stud hole surface exams. Our position is Westinghouse/PCI should have performed a surface exam on the stud holes after machining the holes for the threaded inserts. Westinghouse's position is that the code does not require them to do a surface exam. This issue is similar to that discussed in TIA 2011-015 (attached).

David Failla  
U.S. NRC  
Resident Inspector - Watts Bar Unit 2  
(423)365-3964

17

Poehler, Jeffrey

**From:** Griesbach, Timothy [Tgriesbach@Structint.com]  
**Sent:** Wednesday, August 22, 2012 4:47 PM  
**To:** Poehler, Jeffrey  
**Subject:** RE: EPRI Report on RV Fabrication  
**Attachments:** Pages from EPRI TR-101975-T2 Vol. 6.pdf

Jeff,

Here is the reference. You will have to request this from EPRI. I believe it has been made public.

Tim

Tim Griesbach  
Senior Associate  
Structural Integrity Associates, Inc.  
Experts in the prevention and control of structural and mechanical failures  
5215 Hellyer Ave., Suite 210  
San Jose, CA 95138  
Phone: (408) 833-7350  
Cell: (b)(6)  
Fax: (408) 978-8964  
email: [tgriesbach@structint.com](mailto:tgriesbach@structint.com)

**From:** Poehler, Jeffrey [<mailto:Jeffrey.Poehler@nrc.gov>]  
**Sent:** Tuesday, August 21, 2012 1:03 PM  
**To:** Griesbach, Timothy  
**Subject:** EPRI Report on RV Fabrication

Tim,

Working on the Doel 3 problem and I seem to remember there was an EPRI report from the 1990's that detailed reactor vessel fabrication practices. It seems like it might be a useful starting point for researching some of the metallurgy issues. I think I remember your name being associated with this report but I cannot find it on EPRI's web site. If you can help me identify it or have an electronic copy, I would appreciate it.

Best regards,

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

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**Hills, David**

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**Subject:** FW: August MECC Call  
**Location:** O11-B2  
  
**Start:** Wed 8/22/2012 1:00 PM  
**End:** Wed 8/22/2012 2:30 PM  
**Show Time As:** Tentative  
  
**Recurrence:** (none)  
  
**Meeting Status:** Not yet responded  
  
**Organizer:** Audrain, Margaret  
  
**Importance:** High

*Release*

Vijay,

Could you please participate in the below Materials Engineering Counterparts Call for us on Wednesday this week (1:00 p.m. central)? I am on AL that day and all of our ISI inspectors are out of the office. Just let them know you are on (so we get credit) and take notes. Note that Mel is no longer available to discuss his planned topic and he has already informed the group. In particular, please jot down as much info as you can regarding discussion on the DOEL 3 (Belgium) reactor pressure vessel flaw indications. Bob Hardies from NRR was in Belgium last week obtaining additional information, so should have something to share during this call. Our senior managers are particularly interested in this issue, so we will likely need to update them later this week.

Thanks,  
- Dave

-----Original Appointment-----

Outside of Scope



(b)(6), Outside of Scope

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**Poehler, Jeffrey**

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**From:** Hardies, Robert  
**Sent:** Thursday, August 23, 2012 9:12 AM  
**To:** Poehler, Jeffrey  
**Subject:** FW: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP  
**Attachments:** RPV control in France\_2.doc

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

**From:** CROMBEZ Sebastien [mailto:Sebastien.CROMBEZ@asn.fr]  
**Sent:** Tuesday, August 07, 2012 12:30 PM  
**To:** Petteri.Tiippa@stuk.fi; pierre.briegleb@belv.be; jcb@csn.es; Hardies, Robert; Collins, Jay; Kirk, Mark; dietmar.Kalkhof@ensi.ch; kees.desbouvrie@minvrom.nl  
**Cc:** benoit.deboeck@belv.be; pierre.barras@belv.be; simon.hoebeeck@belv.be; christelle.fonkwa@belv.be; vincent.deledicque@belv.be; Manfred.SCHRAUBEN@FANC.FGOV.BE; An.WERTELAERS@FANC.FGOV.BE; Frederik.VANWONTERGHEM@FANC.FGOV.BE; Beatrice.TOMBUYES@FANC.FGOV.BE; aweyn@vincotte.be; Martti.Vilpas@stuk.fi; LACHAUME Jean-Luc; MONNIN-PARIETTI Carole; STREIBIG Laurent; francois.balestreri@lrsn.fr  
**Subject:** RE: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

Dear all,

Please find enclosed ASN answers to your questions. We focused on French manufacturing experience feedback because, in a few cases, large amount of flaws which seem quite similar to those detected in Doel 3 were observed in France. These flaws were detected and the components rejected before end of manufacturing.

Do not hesitate to ask in case you have something to clarify or to ask additional questions.

ASN will attend the meeting planned on 16<sup>th</sup>.

Best regards

**Sébastien CROMBEZ**  
Autorité de Sûreté Nucléaire  
Nuclear Pressure Equipments Department  
**Director**  
21 boulevard Voltaire  
92 578 15 01078 BOULN CROMBEZ  
Tel : +33 (0) 1 45 83 72 16 - Fax : +33 (0) 1 45 83 72 14

Sébastien Crombez

**De :** Petteri.Tiippana@stuk.fi [mailto:Petteri.Tiippana@stuk.fi]

**Envoyé :** lundi 6 août 2012 10:07

**À :** pierre.briegleb@bely.be; CROMBEZ Sebastien; jcb@csn.es; Robert.Hardies@nrc.gov; Jay.Collins@nrc.gov; Mark.Kirk@nrc.gov; dietmar.Kalkhof@ensi.ch; kees.desbouvrie@minvrom.nl

**Cc :** benoit.deboeck@bely.be; pierre.barras@bely.be; simon.hoebeeck@bely.be; christelle.fonkwa@bely.be; vincent.deledicque@bely.be; Manfred.SCHRAUBEN@FANC.FGOV.BE; An.WERTELAERS@FANC.FGOV.BE; Frederik.VANWONTERGHEM@FANC.FGOV.BE; Beatrice.TOMBUYES@FANC.FGOV.BE; aweyn@vincotte.be; Martti.Vilpas@stuk.fi; Jukka.Harkola@stuk.fi; Olavi.Valkeajarvi@stuk.fi; Petri.Vuorio@stuk.fi

**Objet :** RE: Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

Dear all,

please find our answers to your four questions in the attached file. Do not hesitate to ask in case you have something to clarify or to ask additional questions.

Unfortunately, due to regulatory activities related to outage at Loviisa NPP, we are not able to send our expert to the proposed meeting on the 16<sup>th</sup>. Anyhow, we would be interested on any follow-up on this issue.

Best regards

Petteri Tiippana  
Director  
Nuclear Reactor Regulation  
STUK

**From:** Briegleb Pierre [mailto:pierre.briegleb@bely.be]

**Sent:** Wednesday, July 25, 2012 10:40 AM

**To:** Sebastien.CROMBEZ@asn.fr; CRESPO BRAVO JULIO; Robert.Hardies@nrc.gov; Jay.Collins@nrc.gov; Mark.Kirk@nrc.gov; Tiippana, Petteri; dietmar.Kalkhof@ensi.ch; kees.desbouvrie@minvrom.nl

**Cc:** De Boeck Benoit; Barras Pierre; Hoebeeck Simon; Fonkwa Christelle; Deledicque Vincent; SCHRAUBEN Manfred; WERTELAERS An; VAN WONTERGHEM Frederik; TOMBUYES Beatrice; aweyn@vincotte.be

**Subject:** Potential problem on the reactor pressure vessel (RPV) of the Belgian Doel 3 NPP

Dear Sirs,

We are now facing in Belgium a potential problem on the reactor pressure vessel (RPV) of the Doel 3 NPP.

Non-destructive examination revealed a lot of "indications" that need to be confirmed by another inspection technique (ongoing).

We would like to have your feedback, experience and advice regarding this potential problem. You will find hereunder a more comprehensive background and some questions we would like to answer.

Best regards,

Pierre Briegleb  
National Project Coordinator  
Bel V – Subsidiary of the Federal Agency for Nuclear Control (Belgium)

Potential problem on the reactor pressure vessel

Belgian pressure vessels are inspected according to ASME XI. Volumetric inspections of the beltline zone are normally limited to the circumferential welds and surrounding heat affected zone and base material, within the limits settled by the code.

Additionally, as a result of the experience at Tricastin, inspections aiming at detecting possible underclad defects in the pressure vessel beltline region are planned for all Belgian plants. The first inspection of this kind took place at Doel 3 this summer.

These inspections are performed with a qualified method and encompass the whole height of the vessel beltline region. This means that we inspect clad base material in zones where no volumetric in-service inspection was performed up to now.

At Doel 3, according to the Owner, no underclad defects were detected.

Nevertheless, lot of defect indications of an apparently different type were detected by this UT-inspection aiming at detecting underclad defects, especially in one of the three forged rings (SA-508-cl.3). These indications appear to be laminar flaws, more or less parallel to the inner/outer surface of the pressure vessel, located in- and outside the inspected zone where underclad defects were looked at. Obviously, it is not possible to justify those indications on a one-by-one basis by means of an analytical evaluation according to the App. A of ASME XI code requirements.

The inspection method which revealed the presence of those defects has been qualified for detecting underclad defect.

An inspection of the whole height with the qualified method used to control the beltline welds started on the 16<sup>th</sup> of July; the results should not be available before begin of August. Similar inspections will be performed at Tihange 2 during the month of August.

In the absence of any other explanation at this stage, the Owner supposes to be in presence of fabrication defects.

The Doel 3 and Tihange 2 RPVs were forged by Rotterdam Dockyards (RDM), which according to the Owner provided some 24 vessels in Europe and the US. NUREG 1511 – Suppl. 2, p. 7-3, identifies 8 US units with RDM forged rings. Other European countries possibly concerned are Spain, Switzerland, the Netherlands (Borssele, Dodewaard), and probably others, not identified by Bel V at this stage.

Some questions:

1. Are there in your country RPVs (forged rings) fabricated by Rotterdam Dockyards (RDM)?
2. Is there any known concern with respect to fabrication defects in those rings?
3. Did you perform volumetric inspections in the beltline region which could have detected laminar defects in the beltline base material (a) during fabrication (b) in-service? If the answer is yes, describe which inspection (type, extent, frequency) and the corresponding results.
4. Do you perform inspections aiming at detecting underclad defects? If so, describe which inspection (type, extent, frequency) and the corresponding results.

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**Poehler, Jeffrey**

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**From:** Poehler, Jeffrey : *NR*  
**Sent:** Thursday, August 23, 2012 9:25 AM  
**To:** 'Griesbach, Timothy'  
**Subject:** RE: EPRI Report on RV Fabrication

Gary had it – Thanks for your support!

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

**From:** Griesbach, Timothy [mailto:Tgriesbach@Structint.com]  
**Sent:** Thursday, August 23, 2012 9:15 AM  
**To:** Poehler, Jeffrey  
**Subject:** RE: EPRI Report on RV Fabrication

Jeff,

No problem. I hope you can get a copy. Check with Gary Stevens, he may have it.

Tim

**From:** Poehler, Jeffrey [mailto:Jeffrey.Poehler@nrc.gov]  
**Sent:** Thursday, August 23, 2012 5:28 AM  
**To:** Griesbach, Timothy  
**Subject:** RE: EPRI Report on RV Fabrication

Tim,

Thanks!

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

**From:** Griesbach, Timothy [mailto:Tgriesbach@Structint.com]  
**Sent:** Wednesday, August 22, 2012 4:47 PM  
**To:** Poehler, Jeffrey  
**Subject:** RE: EPRI Report on RV Fabrication

Jeff,

Here is the reference. You will have to request this from EPRI. I believe it has been made public.

Tim

*Tim Griesbach*  
Senior Associate  
*Structural Integrity Associates, Inc.*

*Experts in the prevention and control of structural and mechanical failures*  
5215 Hellyer Ave., Suite 210  
San Jose, CA 95138  
Phone: (408) 833-7350  
Cell: (b)(6)  
Fax: (408) 978-8964  
email: [tgriesbach@structint.com](mailto:tgriesbach@structint.com)

**From:** Poehler, Jeffrey [<mailto:Jeffrey.Poehler@nrc.gov>]  
**Sent:** Tuesday, August 21, 2012 1:03 PM  
**To:** Griesbach, Timothy  
**Subject:** EPRI Report on RV Fabrication

Tim,

Working on the Doel 3 problem and I seem to remember there was an EPRI report from the 1990's that detailed reactor vessel fabrication practices. It seems like it might be a useful starting point for researching some of the metallurgy issues. I think I remember your name being associated with this report but I cannot find it on EPRI's web site. If you can help me identify it or have an electronic copy, I would appreciate it.

Best regards,

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

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**From:** Hiland, Patrick  
**Sent:** Monday, August 27, 2012 3:42 PM  
**To:** Case, Michael  
**Cc:** Richards, Stuart; Fairbanks, Carolyn; Rosenberg, Stacey; Cheok, Michael; Hardies, Robert; Dorman, Dan; Boger, Bruce; Evans, Michele  
**Subject:** Research Assistance Request

The Office of Nuclear Reactor Regulation (NRR), Division of Engineering is requesting that the Office of Nuclear Regulatory Research (RES), Division of Engineering provide research assistance to assess the implications of the indications discovered in the Doel 3 reactor pressure vessel forgings to domestic reactor pressure vessel forgings. Specifically, NRR is requesting technical assistance in the areas of nondestructive examination (NDE) and deterministic and probabilistic fracture mechanics

In the area of NDE, NRR request technical expertise to assess the procedures, techniques, equipment, standards, qualifications, inspections, acceptance criteria and other relevant NDE variables used to examine the Doel 3 reactor pressure vessel forgings. This assistance may include contact with the licensee (Doel 3), the Belgian nuclear regulatory authority and possibly contractors. Travel to Belgium may also be necessary.

In the area of fracture mechanics, NRR requests assistance to support the Belgian regulator, FANC. FANC has requested the participation of Dr. Mark Kirk in an expert peer review panel. The peer review panel would assist the regulator in assessing the deterministic and probabilistic fracture mechanics analyses being prepared by the licensee for Doel 3. Telephone, video conference, and in-person meetings in Belgium would likely be necessary for this effort.

Also in the area of fracture mechanics, NRR requests assistance to perform analyses related to the implications of similar indications (to Doel 3) in domestic reactor pressure vessel forgings. This effort is currently less well defined. The industry has proposed performing both deterministic and probabilistic fracture mechanics analyses of generic reactor pressure vessel forgings with indications similar to those discovered in Doel 3. If the industry performs these analyses, RES would perform confirmatory analyses. In the event that industry did not perform analyses of hypothetically flawed vessels, this request would be for RES to perform research to verify the adequacy of current ASME Section III acceptance criteria for (b)(4) by performing appropriate deterministic or probabilistic fracture mechanics analyses.

**From:** Stevens, Gary *myr*  
**Sent:** Monday, August 27, 2012 4:33 PM  
**To:** Tregoning, Robert; RES\_DE\_CIB; RES\_DE\_CMB; ASME Code Participants  
**Subject:** ASME Code Meeting Report – Subgroup on Evaluation Standards

For those that may be interested, here is a summary report from the August ASME Code meeting in Washington, DC for the Subgroup on Evaluation Standards.

**Group Name:** Subgroup on Evaluation Standards

**When:** Wednesday, 08/15/2012, 8:30 a.m. – 11:50 a.m.

**Where:** Capitol Hill Hyatt Regency, Washington, DC

**Group Charter:** This group is responsible for all Section XI Flaw Evaluation Rules and Acceptance Criteria

**My Capacity:** Member, Secretary

## **SUMMARY**

### **ADMINISTRATIVE ITEMS**

- Membership
  - Warren reported that there were four relevant membership items:
    - Reddy Ganta retired from Westinghouse and will therefore be dropped from WGPFE, WGFE, and SGES.
    - (b)(6)
    - Tim Hardin was approved as an Alternate for Robin Dyle.
- Executive Committee Report (Warren Bamford and Gary Stevens)
  - Met Tuesday afternoon from 3:00 to 7:50 pm.
  - Membership: SC XI currently does not have any SGES members interested in SC XI membership. Warren asked for interested SGES members to let him know and he would put their name on the waiting list for future consideration.
  - NuScale: NuScale and MPR made a high-level presentation describing their new reactor concept.
  - Charters: The charter for the Task Group on Degraded Buried Pipe was revised. The TG has requested full access to C&S Connect. All TG members that do not already have access to C&S Connect and would like access must fill out the ASME PAF-1 form.
  - Nonmandatory Appendices: Activity continues on revising the nonmandatory appendices as guidance, etc. SG NDE and SGES have the only remaining actions. Angah Miessi (SIA) is working on this item for SGES. The proposed changes to the Appendices have been requested soon so that all remaining changes may be sent to the Standards Committee for the November meeting.



- An issue at Doel Nuclear Power Station Unit 3 in Belgium was discussed. Inspections were performed for RPV under-clad cracks. As a part of these examinations, many (over 9,000) laminar defects were detected within the lower shell ring forging. There is a great deal of media sensitivity on this subject. The NRC is sending Bob Hardies of NRR to investigate. Based on current information, there appear to be no significant structural integrity issues.
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- Table IWA 1600-1 is under development. This table lists all other standards referenced in ASME Section XI, e.g., B31.1. Action is needed to review and update the reference to these standards. The Working Group on General Requirements has the primary responsibility for this item. A volunteer from SGES is needed to participate. Darrell Lee volunteered to take on this activity.
- The Executive Committee developed a "Top Ten" Action Items list (see Attachment 3). The list actually contains 14 items. Three items in the list are the responsibility of SGES and they are still on-going.
- It was noted that better up-front review and input from the NRC on ASME action items is needed. Whereas the input is good at the SC XI level, this is too late in the process to receive meaningful input -- such input is better to get at the Working Group level. Gary Stevens will discuss this internally at the NRC to see if the NRC review process can be improved.
- The SG on Industry Experience for New Plants discussed the need for a Code action in Section III to minimize weld residual stress (WRS). It was voted that this topic be pursued in Section III, and it was recommended that a joint Section III/XI Task Group be formed to develop consideration of WRS in Section III based on what has been learned in Section XI.
- There is an initiative to schedule all ASME Code meetings during the week, rather than having meetings begin on Sunday of Code week. One possibility is to shift all meetings one day later and have the meetings run through Friday. The Executive Committee has asked that all groups re-evaluate their meeting times and durations in an effort to consolidate the meetings. Doug Scarth mentioned that moving WGPFE from Monday to Tuesday (i.e., when all other WGs meet) would be very difficult.

- The NRC has a priority list of ASME Code Section III and XI related topics. New lists that separate Section III and Section XI items will be generated and prioritized. The most important items will be tracked to identify specific actions and to ensure that progress is being made.
- Code Inquiries received shortly before ASME Code week were discussed. These will be left up to the discretion of individual subgroups as to whether they're handled at the meeting or the subsequent meeting.
- Code Case Applicability: SGES needs to take action on Code Case N-513-3 to extend its applicability to later editions.
- Division 2 Rewrite: SWG RIM started writing appendices for reactor specific types, including LWR Small Modular Reactors, HTGRs, and the Japanese Liquid Metal Small Modular Reactors.
- Honors
  - None.

### **ACTION ITEMS**

#### **02-3759: Cast Stainless Steel Inspection Issues (Griesbach)**

- Tim Griesbach reported.
- The TG on CASS met on Monday.
- The draft Code Case on methodology to evaluate flaws was discussed at the TG and the WGPFE. Both groups received the action favorably.
- The Code Case will probably be shared with SGES at the November meeting.
- SG NDE now feels that they can proceed with some CASS inspection requirements.

#### **05-248: Implementation of Code Case N-597 (Scarth)**

- Doug Scarth reported.
- Code Case N-597-3 was finalized at the May meeting after being sent out and discussed at WGPFE.
- A new NRC reviewer took some exceptions to the finalize Code Case during this week's meeting.
- Dave Rudland took the action to work with the NRC reviewer to figure out what's needed on this item.

### **"TOP TEN" ITEM !!!**

#### **08-1595: Revision to Article A-3000 for K Calculation Methods for Surface and Subsurface Flaws (Cipolla/Miyazaki)**

- Russ Cipolla was absent. Guy DeBoo reported.
- The proposal was updated to include Action 10-783 below.
- The proposal was updated in support of xLPR and presented to the WGPFE.
- QA is needed.
- Additional discussion on this item will occur at the November WGFE meeting and will attempt to pass it.
- A continuing item, progress is being made.
- No action yet.

#### **08-1642: Revision to Appendix G to Include Nozzle Discontinuity Solutions (Stevens)**

- Gary Stevens reported.
- This item was not discussed at WGFE so no action was taken.

- 09-170: Integral Attachments (Dyle)
  - No report.
- 09-182: Code Case to Incorporate Full Master Curve Approach (Cipolla)
  - Guy DeBoo reported.
  - Bill Server put forth a proposal to finalize this Code Case.
  - The WGFE may vote on this item at November meeting and potentially bring it to SGES.
- 12-841: Operational Leakage (Griesbach)
  - Tim Griesbach reported.
  - Action 09-794 was completed and will be added to the list of completed recurring items.
  - WGPFE is revising Code Case N-513-4 to include elbows, reducers, tees, and heat exchangers with external tubing. In addition, the allowable pressure is being increased from 275 to 375 psig.
  - The WG is reviewing vessel and tanks (Code Case N-705) to see if similar changes are needed.
  - Consistency is needed between Code Cases N-513-4 and N-704.
- 10-783: Revise K Calculation Methods for Circumferential ID Flaws in Cylinders (Lee)
  - Darrell Lee reported.
  - This item was merged with Action 08-1595 above to simplify these two items into one action.
  - Drop this item from the agenda.
- 10-915: Evaluation of Metal Loss in Class 2 and 3 Metallic Piping Buried in a Back-filled Trench (McGill/Scarth)
  - Doug Scarth reported.
  - This item passed at SC XI. Drop this item from the agenda and add it to the list of completed recurring items.
- "TOP TEN" ITEM !!!
- 11-4: Code Case N-809, "Reference Fatigue Crack Growth Rate Curves for Austenitic Stainless Steels in Pressurized Reactor Water Environments" (Cipolla)
  - No report but this item was added to the minutes/agenda for future tracking as it is a "Top Ten" item.
- 11-1991: IOU from Wirtz's Withdrawn Inquiry 10-96 (Dyle/Wirtz)
  - No report.
- 12-552: IWA-9000 Glossary definitions for "evaluation," "engineering evaluation," and "analytical evaluation" (Bamford)
  - Warren Bamford reported.
  - There was no activity on this action.
  - Gary Stevens will discuss this item with Wally Norris to get clarification.
- 12-795: Acceptance Standards for Austenitic Steel Heat Exchangers, IWC-3510 (T. Vo)
  - Truong Vo reported.

- This item was approved at the WG and SGES at the May meeting, pending cleanup of several minor items.
- On the SC XI agenda for tomorrow.
- Attachment 4 incorporates mark-ups from the last meeting.

12-842: Code Case N-694 on Evaluation of Flaws in PWR Reactor Head Nozzles (G. DeBoo)

- Guy DeBoo reported.
- This item passed at the last meeting with a minor change to add a PVP paper as a reference.
- We forgot to put this item on the SC XI agenda for this meeting.
- Will get on SC XI agenda for the November meeting.

12-1411 Clarification of IWB-3514 Acceptance Standards for Flaws in SCC Susceptible Materials (S. Xu)

- Stephen Xu reported.
- An action number was obtained for this item but it was too late to get on the SC XI agenda for this meeting.
- This item will be placed on the SC XI agenda for the November meeting.

12-zzzz: Effects of Residual Stress on Flaw Evaluation (Bamford)

- Warren Bamford reported.
- Guy DeBoo's Task Group on Reference Crack Growth Curves is addressing this item by developing a Nonmandatory Appendix for WRS analysis guidance.
- Continuing effort -- it's too early to obtain an action number until things get more defined.

## **INQUIRIES**

- Four inquiries were discussed:
  - 12-1014 -- IWA-3300 and IWA-3360, Flaw Proximity Characterizations (L. White, OPG)
    1. See Attachment 5.
    2. The inquiry was modified for clarification into two separate inquiries and was been approved by WGFE.
    3. After discussion, some minor changes were made to the inquiries and the accompanying Code Change. These changes are reflected in the attachment.
    4. The item was motioned and seconded. The vote was 14-0-1.
  - 12-1275 -- IWA-1400(b) and Table IWB-2500-1, Examination Category B-P, All Pressure Retaining Components (T. Lupold, NRC)
    1. See Attachment 6.
    2. The original inquiry was revised by both WG GR and WG PT. The changes are reflected in the attachment.
    3. The item was discussed but it was noted that this item was not under SGES's jurisdiction.
    4. There was no disagreement on this item. No vote was taken.
  - 12-1353 -- ASME BPVC, Section XI, 2004 Edition - Subsection IWB (J. Stevenson, Constellation)
    1. See Attachment 7.
    2. This item was briefly discussed as it was originally placed on the agenda. However, SGES does not have jurisdiction for the subject matter, so it was subsequently referred to SGWCS.

- 12-1240 -- Three separate inquiries (R. Turner, TVA)
  1. See Attachment 8.
  2. The first two inquiries in the attachment were held back, so there was no action on these items.
  3. The third inquiry was discussed and it was decided that it will be withdrawn and consolidated into the update of Code Case N-513 (Action No. 12-841).

## **RECURRING ITEMS**

### **R1. Errata**

- No new errata.

### **R2. Fatigue Issues (Stevens)**

- EPRI's EAF Advisory Panel met on Monday from 2:00 to 6:00 pm.
- EPRI collected industry comments on the 2.5-hour summary presentation made by NRC/ANL at the May meeting on all of their EAF research activities to-date and provided those comments to the NRC.
- EPRI is restructuring their EAF activities into two parts: (1) a near-term effort for license renewal and operating plants headed by Ken Wolfe with support from Shannon Chu, and (2) a longer-term effort directed at research activities identified by EPRI's Gap Report headed by Jean Smith with support from Letitia Midmore.

### **R3. Working Group Reports**

- WGPFE (Scarth)
  - A proposed Code Case for Class 2/3 heat exchangers was developed (see Attachment 9).
  - The Code Case is more of an operability assessment vs. evaluation. The question is whether such an assessment is needed in the Code or should it be more evaluation specific.
  - This item will be discussed more at the next WG meeting.
  - After discussion, it was decided that the Code Case should be revised to be more like a structured evaluation and remove the operability assessment.
- WGOPC (Griesbach)
  - There were multiple NRC presentations at the meeting on the subject of RPV heatup/cooldown integrity assessments and the effects of cladding based on the NRC's 10 CFR 50 Appendix G efforts. There will be ongoing discussions.
  - There will be two public meetings at NRC headquarters on August 28, 2012: (1) in the morning with the PWR Owner's Group on extended beltline issues, and (2) in the afternoon with industry on the heatup/cooldown assessments. Both meetings will be noticed early next week.
- WGFE (DeBoo for Cipolla)
  - The WG has been developing improvements to stress intensity factors for buried flaws. The buried flaw work has been completed. Subsurface stress intensity factors are under development.
  - Modifications to Appendix K were discussed; a presentation will be given by the NRC at the November meeting.

### **R4. References to Other Standards, Table IWA-1600-1 (Lee)**

- Darrell Lee agreed to champion this effort for SGES and coordinate the SGES input with Kevin Rhyne of WGGR.

### **R5. Task Group Reports**

- **Task Group on HDPE Pipe (Scarth)**

- Doug Scarth reported.
- The TG did not meet.
- Phil Rush is the new Chair for this TG.
- The TG will meet in November.
- The challenge is to provide TG focus.
- This subject will proceed in November.
- **Task Group on Evaluation of Beyond Design Basis Events (Pace)**
  - Ray Pace reported.
  - The TG met on Tuesday from 4:00 to 6:00 pm.
  - 5 presentations were made (out of 7 scheduled).
  - T. Vo provided a presentation regarding EPRI guidance on re-start requirements after the North Anna earthquake.
  - George Anataki presented ASME beyond design basis events for DOE complexes and provided some ideas on how the TG might put together guidance on this topic. This included field walk-downs and PRA required for more important facilities.
  - Bud Brust gave two presentations, one on transition break size LBB evaluation and surface cracking and one on margin between Code allowables and structural evaluation. He also discussed the RCS loop modeled with 5 flaws and  $10^{-6}$  earthquake.
  - Dr. Hojo gave a presentation in which a vessel was evaluated with 2,000 cycles with Level D JSME requirements; the analysis demonstrated considerable margin.
  - The TG is going to start preparing something at the next meeting.

#### **R6. Additional Approved Action Items Retained Until Printed**

- "TOP TEN" ITEM !!!! -- 05-1328: Alternative Acceptance Criteria and Evaluation Procedure for Flaws in Ferritic Steel Components Operating in the Upper Shelf Range (Cipolla)
- (Errata) Keep Appendices proof mark-up issues on agenda until published.
- (Errata) N-641 identified by Nathan Palm (Westinghouse) -- Warren provided this item to Ryan Crane for processing at the February meeting.
- 03-1377: Code Case for RT<sub>10</sub> (Cipolla)
- 05-1328: Alternative Acceptance Criteria and Evaluation Procedure for Flaws in Ferritic Steel Components Operating in the Upper Shelf Range (Cipolla)
- 07-1307: Class 1, 2, and 3 Flaw Evaluation for Pipes Less Than NPS 4" (Cipolla)
- 09-159: EPRI-MRP-BWRVIP Risk Informed Appendix G Work (Server/Griesbach)
  - Need to verify that editorials submitted in November 2011 SC XI meeting get implemented.
- 09-794: Operational Leakage (Griesbach)
- 10-915: Evaluation of Metal Loss in Class 2 and 3 Metallic Piping Buried in a Back-filled Trench (McGill/Scarth)
- 11-61: Change to IWB-3112/IWC-3112 to Allow Evaluation of Subsurface Flaws Found During Pre-Service Inspections (Stevens)
- 11-207: Improvements in Evaluation of Flaws in PWR Reactor Head Nozzles (Guy DeBoo)
- 11-1791: Change to IWB-3112/IWC-3112 to Allow Evaluation of Subsurface Flaws Found During Pre-Service Inspections (Stevens)
- 11-1996: (Errata) An editorial change to Appendix G and a Table note correction for Appendix A.

#### **NEW BUSINESS**

- Dr. Kunio Hasegawa (JNES) gave a presentation on the restructuring of the Japanese nuclear regulator (see Attachment 10).

- A new regulatory structure was approved in June to become effective starting on 9/1/12.
- The key motivation is to ensure separation between nuclear power promotion and regulation responsibilities. A new entity will be formed entitled Nuclear Regulatory Agency (or Organization, depending on the correct English translation).
- More detail and structure will be provided at the November meeting.

The meeting was adjourned at ~11:50 a.m.

Let me know if you have any questions, or would like to see any of the attachments.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

**Neurauter, James**

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**From:** Hills, David  
**Sent:** Monday, August 27, 2012 4:19 PM  
**To:** Bilik, Tom; Bozga, John; Holmberg, Mel; Jones, Donald; Meghanl, Vijay; Neurauter, James; Sanchez Santiago, Elba; Shaikh, Atif  
**Subject:** FW: ASME Code Meeting Report -- Subgroup on Evaluation Standards

*Release*

**From:** Stevens, Gary  
**Sent:** Monday, August 27, 2012 3:33 PM  
**To:** Tregoning, Robert; RES\_DE\_CIB; RES\_DE\_CMB; ASME Code Participants  
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**When:** Wednesday, 08/15/2012, 8:30 a.m. – 11:50 a.m.

**Where:** Capitol Hill Hyatt Regency, Washington, DC

**Group Charter:** This group is responsible for all Section XI Flaw Evaluation Rules and Acceptance Criteria

**My Capacity:** Member, Secretary

**SUMMARY**

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    - Reddy Ganta retired from Westinghouse and will therefore be dropped from WGPFE, WGFE, and SGES.
    - (b)(6)
    - Tim Hardin was approved as an Alternate for Robin Dyle.
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  - Met Tuesday afternoon from 3:00 to 7:50 pm.
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### **ACTION ITEMS**

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### **"TOP TEN" ITEM !!!**

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- Russ Cipolla was absent. Guy DeBoo reported.
- The proposal was updated to include Action 10-783 below.
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## **RECURRING ITEMS**

### **R1. Errata**

- No new errata.

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- The WG has been developing improvements to stress intensity factors for buried flaws. The buried flaw work has been completed. Subsurface stress intensity factors are under development.
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- Darrell Lee agreed to champion this effort for SGES and coordinate the SGES input with Kevin Rhyne of WGGR.

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- The TG did not meet.
- Phil Rush is the new Chair for this TG.
- The TG will meet in November.
- The challenge is to provide TG focus.
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- Ray Pace reported.
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- 5 presentations were made (out of 7 scheduled).
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- George Anataki presented ASME beyond design basis events for DOE complexes and provided some ideas on how the TG might put together guidance on this topic. This included field walk-downs and PRA required for more important facilities.
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- 11-1791: Change to IWB-3112/IWC-3112 to Allow Evaluation of Subsurface Flaws Found During Pre-Service Inspections (Stevens)
- 11-1996: (Errata) An editorial change to Appendix G and a Table note correction for Appendix A.

#### **NEW BUSINESS**

- Dr. Kunio Hasegawa (JNES) gave a presentation on the restructuring of the Japanese nuclear regulator (see Attachment 10).
  - A new regulatory structure was approved in June to become effective starting on 9/1/12.
  - The key motivation is to ensure separation between nuclear power promotion and regulation responsibilities. A new entity will be formed entitled Nuclear Regulatory Agency (or Organization, depending on the correct English translation).
  - More detail and structure will be provided at the November meeting.

The meeting was adjourned at ~11:50 a.m.

Let me know if you have any questions, or would like to see any of the attachments.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

A - 49

**Kusnick, Joshua**

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**From:** Johnson, Kevin  
**Sent:** Tuesday, August 28, 2012 10:52 AM  
**To:** Dion, Jeanne  
**Cc:** Rini, Brett; Csontos, Aladar  
**Subject:** RE: Research Assistance Request

Good Morning!

A new action has been assigned to your Division:

ATMIS 2012558

**Subject:** Research Assistance Request to assess the implications of the indications discovered in the Doel 3 reactor pressure vessel forgings to domestic reactor pressure vessel forgings NRR-2012-005 (RAR)

Update the FO – 9/18/2012

Please forward Patrick Hiland email to your division AAs to add to ADAMS, that will be considered our incoming for the record.

Thank you.

Kevin

One Team/One Goal

Kevin D. Johnson  
Research Information Specialist  
Office of Nuclear Regulatory Research  
RES/PMDA/HCCB  
Email: [Kevin.Johnson@nrc.gov](mailto:Kevin.Johnson@nrc.gov)  
O6AO6a  
Office: 301-251-7665  
Cell: (b)(6)

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**From:** Dion, Jeanne  
**Sent:** Tuesday, August 28, 2012 8:21 AM  
**To:** Johnson, Kevin  
**Cc:** Rini, Brett; Csontos, Aladar  
**Subject:** FW: Research Assistance Request

Hi Kevin,

Can you please ticket DE/AI Csontos to formulate an email response regarding NRR's research assistance request by September 18<sup>th</sup>?

The email will be from Mike Case to Pat Hiland.

Thanks,



Jeanne Dion  
Technical Assistant  
U.S. Nuclear Regulatory Commission  
Office of Nuclear Regulatory Research  
Division of Engineering  
[jeanne.dion@nrc.gov](mailto:jeanne.dion@nrc.gov)  
301-251-7482

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**From:** Case, Michael  
**Sent:** Tuesday, August 28, 2012 7:20 AM  
**To:** Dion, Jeanne  
**Cc:** Rini, Brett; Sheron, Brian; Uhle, Jennifer; Richards, Stuart; Csontos, Aladar  
**Subject:** FW: Research Assistance Request

Hi Jeanne. Can you work with the front office and ticket this back to us (CIB) for a response. Since it's a RAR, we can respond at the division level.

---

**From:** Hiland, Patrick  
**Sent:** Monday, August 27, 2012 3:42 PM  
**To:** Case, Michael  
**Cc:** Richards, Stuart; Fairbanks, Carolyn; Rosenberg, Stacey; Cheok, Michael; Hardies, Robert; Dorman, Dan; Boger, Bruce; Evans, Michele  
**Subject:** Research Assistance Request

The Office of Nuclear Reactor Regulation (NRR), Division of Engineering is requesting that the Office of Nuclear Regulatory Research (RES), Division of Engineering provide research assistance to assess the implications of the indications discovered in the Doel 3 reactor pressure vessel forgings to domestic reactor pressure vessel forgings. Specifically, NRR is requesting technical assistance in the areas of nondestructive examination (NDE) and deterministic and probabilistic fracture mechanics

In the area of NDE, NRR request technical expertise to assess the procedures, techniques, equipment, standards, qualifications, inspections, acceptance criteria and other relevant NDE variables used to examine the Doel 3 reactor pressure vessel forgings. This assistance may include contact with the licensee (Doel 3), the Belgian nuclear regulatory authority and possibly contractors. Travel to Belgium may also be necessary.

In the area of fracture mechanics, NRR requests assistance to support the Belgian regulator, FANC. FANC has requested the participation of Dr. Mark Kirk in an expert peer review panel. The peer review panel would assist the regulator in assessing the deterministic and probabilistic fracture mechanics analyses being prepared by the licensee for Doel 3. Telephone, video conference, and in-person meetings in Belgium would likely be necessary for this effort.

Also in the area of fracture mechanics, NRR requests assistance to perform analyses related to the implications of similar indications (to Doel 3) in domestic reactor pressure vessel forgings. This effort is currently less well defined. The industry has proposed performing both deterministic and probabilistic fracture mechanics analyses of generic reactor pressure vessel forgings with indications similar to those discovered in Doel 3. If the industry performs these analyses, RES would perform confirmatory analyses. In the event that industry did not perform analyses of hypothetically flawed vessels, this request would be for RES to perform research to verify the adequacy of current ASME Section III acceptance criteria for laminar flaws in reactor pressure vessel forgings by performing appropriate deterministic or probabilistic fracture mechanics analyses.

Lupold, Timothy

**From:** Honcharik, John *NRO*  
**Sent:** Tuesday, August 28, 2012 7:48 AM  
**To:** Csontos, Aladar; Rathbun, Howard; Rudland, David; Lupold, Timothy  
**Cc:** Stevens, Gary; Norris, Wallace; Terao, David  
**Subject:** RE: ASME Code Meeting Report -- Subgroup on Evaluation Standards

Just wanted to thank you in helping and supporting me in getting ASME to look into addressing weld residual stresses in Section III for construction (as noted below).

It was a hard battle, and even if they don't do much, a least they know that the NRC considers weld residual stresses to be important.

And as you know, there is currently a real life case in Vogtle 3 RV nozzles/safe-ends. Recently, NRO office director and RII communicated with the licensee's upper management about the residual stresses. The licensee is currently looking into the weld residual stresses caused by the ID weld repairs to ensure it has not increased the probability of PWSCC. **This information is pre-decisional** at the moment, until we get confirmation from the Region.

**From:** Stevens, Gary *NRR*  
**Sent:** Monday, August 27, 2012 4:33 PM  
**To:** Tregoning, Robert; RES\_DE\_CIB; RES\_DE\_CMB; ASME Code Participants  
**Subject:** ASME Code Meeting Report -- Subgroup on Evaluation Standards

For those that may be interested, here is a summary report from the August ASME Code meeting in Washington, DC for the Subgroup on Evaluation Standards.

**Group Name:** Subgroup on Evaluation Standards

**When:** Wednesday, 08/15/2012, 8:30 a.m. – 11:50 a.m.

**Where:** Capitol Hill Hyatt Regency, Washington, DC

**Group Charter:** This group is responsible for all Section XI Flaw Evaluation Rules and Acceptance Criteria

**My Capacity:** Member, Secretary

## **SUMMARY**

### **ADMINISTRATIVE ITEMS**

- Membership
  - Warren reported that there were four relevant membership items:
    - Reddy Ganta retired from Westinghouse and will therefore be dropped from WGPFE, WGFE, and SGES.
    - (b)(6)
    - Tim Hardin was approved as an Alternate for Robin Dyle.

- Executive Committee Report (Warren Bamford and Gary Stevens)
  - Met Tuesday afternoon from 3:00 to 7:50 pm.
  - Membership: SC XI currently does not have any SGES members interested in SC XI membership. Warren asked for interested SGES members to let him know and he would put their name on the waiting list for future consideration.
  - NuScale: NuScale and MPR made a high-level presentation describing their new reactor concept.
  - Charters: The charter for the Task Group on Degraded Buried Pipe was revised. The TG has requested full access to C&S Connect. All TG members that do not already have access to C&S Connect and would like access must fill out the ASME PAF-1 form.
  - Nonmandatory Appendices: Activity continues on revising the nonmandatory appendices as guidance, etc. SG NDE and SGES have the only remaining actions. Angah Miessi (SIA) is working on this item for SGES. The proposed changes to the Appendices have been requested soon so that all remaining changes may be sent to the Standards Committee for the November meeting.
  - An issue at Doel Nuclear Power Station Unit 3 in Belgium was discussed. Inspections were performed for RPV under-clad cracks. As a part of these examinations, many (over 9,000) laminar defects were detected within the lower shell ring forging. There is a great deal of media sensitivity on this subject. The NRC is sending Bob Hardies of NRR to investigate. Based on current information, there appear to be no significant structural integrity issues.
  - Gravelines Nuclear Power Station in France has experienced one bottom-mounted instrument (BMI) nozzle indication. The indication is longitudinal and 80% through-wall. The penetration has been plugged and removed from service. As a result, the French regulatory authority has required that all plants inspect BMI nozzles. Previously, the regulator decided that no inspections were required because the BMI penetrations operate at  $T_{cold}$ . To-date, no additional indications have been found. EPRI/MRP is meeting with EdF to discuss, and so is the NRC. Following those meetings, EPRI and the NRC will discuss what is needed in the U.S.
  - ASME Certification marks (formerly known as "Code stamps"): Stamps for nuclear components have been replaced with a new common certification mark. However, for nuclear components, the NRC has not yet approved the Code Edition that incorporates the new certification mark, nor have they approved the Code Case that justifies use of the new certification mark in lieu of the old Code stamps. This is problematic in that some plants have already installed replacement parts that use the new certification mark, which vendors are required to use. The NRC and ASME management will be discussing this issue during this Friday's semi-annual ASME/NRC Management Meeting.
  - Table IWA 1600-1 is under development. This table lists all other standards referenced in ASME Section XI, e.g., B31.1. Action is needed to review and update the reference to these standards. The Working Group on General Requirements has the primary responsibility for this item. A volunteer from SGES is needed to participate. Darrell Lee volunteered to take on this activity.
  - The Executive Committee developed a "Top Ten" Action Items list (see Attachment 3). The list actually contains 14 items. Three items in the list are the responsibility of SGES and they are still on-going.

- It was noted that better up-front review and input from the NRC on ASME action items is needed. Whereas the input is good at the SC XI level, this is too late in the process to receive meaningful input -- such input is better to get at the Working Group level. Gary Stevens will discuss this internally at the NRC to see if the NRC review process can be improved.
- The SG on Industry Experience for New Plants discussed the need for a Code action in Section III to minimize weld residual stress (WRS). It was voted that this topic be pursued in Section III, and it was recommended that a joint Section III/XI Task Group be formed to develop consideration of WRS in Section III based on what has been learned in Section XI.
- There is an initiative to schedule all ASME Code meetings during the week, rather than having meetings begin on Sunday of Code week. One possibility is to shift all meetings one day later and have the meetings run through Friday. The Executive Committee has asked that all groups re-evaluate their meeting times and durations in an effort to consolidate the meetings. Doug Scarth mentioned that moving WGPFE from Monday to Tuesday (i.e., when all other WGs meet) would be very difficult.
- The NRC has a priority list of ASME Code Section III and XI related topics. New lists that separate Section III and Section XI items will be generated and prioritized. The most important items will be tracked to identify specific actions and to ensure that progress is being made.
- Code Inquiries received shortly before ASME Code week were discussed. These will be left up to the discretion of individual subgroups as to whether they're handled at the meeting or the subsequent meeting.
- Code Case Applicability: SGES needs to take action on Code Case N-513-3 to extend its applicability to later editions.
- Division 2 Rewrite: SWG RIM started writing appendices for reactor specific types, including LWR Small Modular Reactors, HTGRs, and the Japanese Liquid Metal Small Modular Reactors.
- Honors
  - None.

#### **ACTION ITEMS**

##### **02-3759: Cast Stainless Steel Inspection Issues (Griesbach)**

- Tim Griesbach reported.
- The TG on CASS met on Monday.
- The draft Code Case on methodology to evaluate flaws was discussed at the TG and the WGPFE. Both groups received the action favorably.
- The Code Case will probably be shared with SGES at the November meeting.
- SG NDE now feels that they can proceed with some CASS inspection requirements.

##### **05-248: Implementation of Code Case N-597 (Scarth)**

- Doug Scarth reported.
- Code Case N-597-3 was finalized at the May meeting after being sent out and discussed at WGPFE.
- A new NRC reviewer took some exceptions to the finalize Code Case during this week's meeting.

- Dave Rudland took the action to work with the NRC reviewer to figure out what's needed on this item.

**"TOP TEN" ITEM !!!**

**08-1595: Revision to Article A-3000 for K Calculation Methods for Surface and Subsurface Flaws (Cipolla/Miyazaki)**

- Russ Cipolla was absent. Guy DeBoo reported.
- The proposal was updated to include Action 10-783 below.
- The proposal was updated in support of xLPR and presented to the WGPFE.
- QA is needed.
- Additional discussion on this item will occur at the November WGFE meeting and will attempt to pass it.
- A continuing item, progress is being made.
- No action yet.

**08-1642: Revision to Appendix G to Include Nozzle Discontinuity Solutions (Stevens)**

- Gary Stevens reported.
- This item was not discussed at WGFE so no action was taken.

**09-170: Integral Attachments (Dyle)**

- No report.

**09-182: Code Case to Incorporate Full Master Curve Approach (Cipolla)**

- Guy DeBoo reported.
- Bill Server put forth a proposal to finalize this Code Case.
- The WGFE may vote on this item at November meeting and potentially bring it to SGES.

**12-841: Operational Leakage (Griesbach)**

- Tim Griesbach reported.
- Action 09-794 was completed and will be added to the list of completed recurring items.
- WGPFE is revising Code Case N-513-4 to include elbows, reducers, tees, and heat exchangers with external tubing. In addition, the allowable pressure is being increased from 275 to 375 psig.
- The WG is reviewing vessel and tanks (Code Case N-705) to see if similar changes are needed.
- Consistency is needed between Code Cases N-513-4 and N-704.

**10-783: Revise K Calculation Methods for Circumferential ID Flaws in Cylinders (Lee)**

- Darrell Lee reported.
- This item was merged with Action 08-1595 above to simplify these two items into one action.
- Drop this item from the agenda.

**10-915: Evaluation of Metal Loss in Class 2 and 3 Metallic Piping Buried in a Back-filled Trench (McGill/Scarth)**

- Doug Scarth reported.
- This item passed at SC XI. Drop this item from the agenda and add it to the list of completed recurring items.

**"TOP TEN" ITEM !!!**

- 11-4: Code Case N-809, "Reference Fatigue Crack Growth Rate Curves for Austenitic Stainless Steels in Pressurized Reactor Water Environments" (Cipolla)
- No report but this item was added to the minutes/agenda for future tracking as it is a "Top Ten" item.
- 11-1991: IOU from Wirtz's Withdrawn Inquiry 10-96 (Dyle/Wirtz)
- No report.
- 12-552: IWA-9000 Glossary definitions for "evaluation," "engineering evaluation," and "analytical evaluation" (Bamford)
- Warren Bamford reported.
  - There was no activity on this action.
  - Gary Stevens will discuss this item with Wally Norris to get clarification.
- 12-795: Acceptance Standards for Austenitic Steel Heat Exchangers, IWC-3510 (T. Vo)
- Truong Vo reported.
  - This item was approved at the WG and SGES at the May meeting, pending cleanup of several minor items.
  - On the SC XI agenda for tomorrow.
  - Attachment 4 incorporates mark-ups from the last meeting.
- 12-842: Code Case N-694 on Evaluation of Flaws in PWR Reactor Head Nozzles (G. DeBoo)
- Guy DeBoo reported.
  - This item passed at the last meeting with a minor change to add a PVP paper as a reference.
  - We forgot to put this item on the SC XI agenda for this meeting.
  - Will get on SC XI agenda for the November meeting.
- 12-1411 Clarification of IWB-3514 Acceptance Standards for Flaws in SCC Susceptible Materials (S. Xu)
- Stephen Xu reported.
  - An action number was obtained for this item but it was too late to get on the SC XI agenda for this meeting.
  - This item will be placed on the SC XI agenda for the November meeting.
- 12-~~zzzz~~: Effects of Residual Stress on Flaw Evaluation (Bamford)
- Warren Bamford reported.
  - Guy DeBoo's Task Group on Reference Crack Growth Curves is addressing this item by developing a Nonmandatory Appendix for WRS analysis guidance.
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- 11-207: Improvements in Evaluation of Flaws in PWR Reactor Head Nozzles (Guy DeBoo)
- 11-1791: Change to IWB-3112/IWC-3112 to Allow Evaluation of Subsurface Flaws Found During Pre-Service Inspections (Stevens)
- 11-1996: (Errata) An editorial change to Appendix G and a Table note correction for Appendix A.

#### **NEW BUSINESS**

- Dr. Kunio Hasegawa (JNES) gave a presentation on the restructuring of the Japanese nuclear regulator (see Attachment 10).
  - A new regulatory structure was approved in June to become effective starting on 9/1/12.
  - The key motivation is to ensure separation between nuclear power promotion and regulation responsibilities. A new entity will be formed entitled Nuclear Regulatory Agency (or Organization, depending on the correct English translation).
  - More detail and structure will be provided at the November meeting.

The meeting was adjourned at ~11:50 a.m.

Let me know if you have any questions, or would like to see any of the attachments.

Gary L. Stevens  
 Senior Materials Engineer  
 NRC/RES/DE/CIB  
 E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
 Office: 301-251-7569  
 Blackberry: (b)(6)

2-8  
**Nove, Carol**

---

**From:** Kirk, Mark  
**Sent:** Wednesday, August 29, 2012 10:23 AM  
**To:** Nove, Carol  
**Subject:** Fw: Doel 3

See below

Mark Kirk,

(b)(6)

Cell

(b)(6)

---

**From:** Kirk, Mark  
**To:** Nove, Carol  
**Sent:** Wed Aug 29 10:21:50 2012  
**Subject:** Re: Doel 3

See my other e-mails. Who is asking and why do they want to know. This is hardly a secret.

Mark Kirk,

(b)(6)

Cell

(b)(6)

---

**From:** Nove, Carol  
**To:** Kirk, Mark  
**Sent:** Wed Aug 29 10:09:43 2012  
**Subject:** RE: Doel 3

No, I don't still have it. Do you have the NUREG number handy?

**From:** Kirk, Mark  
**Sent:** Wednesday, August 29, 2012 10:09 AM  
**To:** Nove, Carol  
**Subject:** Re: Doel 3

Yes, the list came from a publically available NUREG. Do you still have it?

Mark Kirk,

(b)(6)

Cell

(b)(6)

---

**From:** Nove, Carol  
**To:** Kirk, Mark  
**Sent:** Wed Aug 29 10:05:20 2012  
**Subject:** FW: Doel 3

Mark,

Last month, I believe that you provided a list of RPVs forged by Rotterdam to Belgium. Was that list publicly available? Please see request below.

Thanks,  
Carol

**From:** Collins, Jay  
**Sent:** Wednesday, August 29, 2012 9:58 AM

**To:** Nove, Carol  
**Subject:** FW: Doel 3

**From:** [John.NAKOSKI@oecd.org](mailto:John.NAKOSKI@oecd.org) [<mailto:John.NAKOSKI@oecd.org>]  
**Sent:** Wednesday, August 29, 2012 9:36 AM  
**To:** Collins, Jay  
**Subject:** RE: Doel 3

Jay,

My next visit to the US will be over the Christmas/New Year holidays. From 22 December 2012 until 6 January 2013. My contract here is being extended to run through 30 June 2014 now.

I did find information on the NRC public website (material surveillance program) that discusses the manufacturer for RPVs in the US, and I did find in the Quad Cities FSAR a reference to unit 2 having its lower head, in part, manufactured by RDM. However, another question that I have relates to the Atucha 1 and 2 reactors in Argentina. Some information I had suggested that Atucha 1's RPV was fabricated (or portions of it) at RDM. Digging deeper I also have some information that Atucha 2's RPV was made at RDM. This created a bit of a political fallout when Argentina said that Atucha 1 was not made at RDM, but by Siemens. Oh well. If your knowledgeable folks know anything about Atucha 1 and/or 2 RPVs and where they were made that is public, I would appreciate a pointer to this information.

Thanks my friend,

John

**From:** Collins, Jay [<mailto:Jay.Collins@nrc.gov>]  
**Sent:** Wednesday, August 29, 2012 15:28  
**To:** NAKOSKI John, NEA/SURN  
**Subject:** RE: Doel 3

Greetings Good Sir,

I'm not the man, unfortunately, to provide you a good answer. I did send your request over to the knowledgeable folks, so I will see what they provide.

Good to hear from you though. When are you due back in the US?

Jay

**From:** [John.NAKOSKI@oecd.org](mailto:John.NAKOSKI@oecd.org) [<mailto:John.NAKOSKI@oecd.org>]  
**Sent:** Thursday, August 23, 2012 9:10 AM  
**To:** Collins, Jay  
**Subject:** Doel 3

Jay,

Hi – it has been too long since I said hello – and now I am saying hello and asking for a favor. Is there any information that you can share with me (public) about which of the US nuclear power plants have portions of the reactor pressure vessels that were manufactured by Rotterdam shipyards? The list that we put on the NEA's website that was built from a reliable source included Quad Cities 1 (a BWR) and we are getting questions about this unit. I understand if you cannot

share information with me that is proprietary, but if you could point me to a public site with this information I would appreciate it. Thanks!

Best regards,

*John A. Nakoski*

Nuclear Safety Analyst  
Division of Nuclear Safety  
OECD Nuclear Energy Agency  
+(33) 01.45.24.11.51  
[john.nakoski@oecd.org](mailto:john.nakoski@oecd.org)

A-5  
**Kusnick, Joshua**

---

**From:** Csontos, Aladar  
**Sent:** Wednesday, September 05, 2012 5:46 PM  
**To:** Dion, Jeanne  
**Subject:** Re: Research Assistance Request

Sounds good

---

**From:** Dion, Jeanne  
**To:** Csontos, Aladar  
**Sent:** Wed Sep 05 17:45:17 2012  
**Subject:** RE: Research Assistance Request

(b)(5)

Al,  
If you agree with my shot in the dark below- I'll work with Stephanie to revise the memo. Anyone else I should run this by?

(b)(5)

Jeanne

**From:** Csontos, Aladar  
**Sent:** Wednesday, September 05, 2012 3:29 PM  
**To:** Dion, Jeanne  
**Subject:** RE: Research Assistance Request

(b)(5)

---

**From:** Dion, Jeanne  
**To:** Csontos, Aladar  
**Sent:** Wed Sep 05 15:14:17 2012  
**Subject:** RE: Research Assistance Request

(b)(5)

**From:** Csontos, Aladar  
**Sent:** Wednesday, September 05, 2012 2:23 PM  
**To:** Richards, Stuart  
**Cc:** Case, Michael; Tregoning, Robert; Dion, Jeanne  
**Subject:** Re: Research Assistance Request

(b)(5)

---

**From:** Richards, Stuart  
**To:** Csontos, Aladar  
**Cc:** Case, Michael; Tregoning, Robert; Dion, Jeanne  
**Sent:** Wed Sep 05 14:10:39 2012  
**Subject:** RE: Research Assistance Request

Al

(b)(5)

Stu

**From:** Hiland, Patrick

**Sent:** Monday, August 27, 2012 3:42 PM

**To:** Case, Michael

**Cc:** Richards, Stuart; Fairbanks, Carolyn; Rosenberg, Stacey; Cheok, Michael; Hardies, Robert; Dorman, Dan; Boger, Bruce; Evans, Michele

**Subject:** Research Assistance Request

(b)(5)

September 6, 2012

MEMORANDUM TO: Patrick Hiland, Director  
Division of Engineering  
Office of Nuclear Reactor Regulation

FROM: Michael J. Case, Director */RA/ S. Richards for*  
Division of Engineering  
Office of Nuclear Regulatory Research

SUBJECT: RESPONSE TO RESEARCH ASSISTANCE REQUEST TO  
ASSESS THE IMPLICATIONS OF THE INDICATIONS  
DISCOVERED IN THE DOEL 3 REACTOR PRESSURE VESSEL  
IN BELGIUM (NRR-2012-005) (RAR)

On August 27<sup>th</sup>, 2012, the Division of Engineering in the Office of Nuclear Reactor Regulation (NRR) requested technical assistance from the Office of Nuclear Regulatory Research (RES) to provide assistance to assess the implications of the indications discovered in the Doel 3 reactor pressure vessel (RPV) ring forgings to domestic RPV forgings (see ADAMS [ML12242A258](#)). NRR requested technical assistance in the areas of nondestructive examination (NDE) and deterministic and probabilistic fracture mechanics. Specifically, the assistance requested provides support on three fronts:

1. **NON-DESTRUCTIVE EXAMINATION (NDE):**

- a. **Tasks:** RES will provide NRR with technical expertise to assess the procedures, techniques, equipment, standards, qualifications, inspections, acceptance criteria and other relevant NDE variables used to examine the Doel 3 RPV forgings. This assistance may include contact with the licensee at Doel, with the Belgian Nuclear Regulatory Authority, and possibly with contractors. Travel to Belgium may also be necessary.
- b. **Schedule:** The schedule will be determined based on the availability of information from Belgium and on Nuclear Regulatory Commission (NRC) prioritization. RES understands that this is a high priority matter and will work with NRR to expedite the needed work.
- c. **Deliverables:** Support via e-mail, telephone, and meetings are anticipated. Topical reports and/or memoranda can be prepared as needed.
- d. **RES Point of Contact:** Carol Nove, RES/DE/CIB, [carol.nove@nrc.gov](mailto:carol.nove@nrc.gov)

CONTACT: Mark Kirk, RES/DE  
301-251-7631



2. **Fracture Mechanics, Support of the Belgian Regulatory Authority, Federal Authority for Nuclear Control (FANC):**

- a. RES will provide NRR with technical assistance to support the Belgian regulator, FANC. The FANC has requested the participation of RES staff member Mark Kirk in an international working group of experts in the area of structural mechanics and fracture mechanics (see ADAMS ML12242A335). The working group will assist FANC in assessing the safety case being prepared by the licensee for Doel 3, which is likely to include both deterministic and probabilistic fracture mechanics analyses. It is anticipated that prior review of the licensee's presentation material, telephone, video conference, and in-person meetings in Belgium will be necessary to support this effort.
- b. **Schedule:** Schedule will be determined by FANC and based on NRC prioritization. The invitation letter from FANC stated that one or two meetings, each of 1-2 days duration, are planned for September-October 2012. These meetings will occur in Brussels, Belgium. RES understands that this is a high priority matter and will work with NRR to expedite the needed work.
- c. **Deliverables:** Attendance and participation in the international working group meetings and support of any work products arising from these meetings is anticipated. NRR management will be briefed on the outcome of the meetings following their completion, and a meeting summary will be prepared.
- d. **RES Point of Contact:** Mark Kirk, RES/DE/CIB, [mark.kirk@nrc.gov](mailto:mark.kirk@nrc.gov)

3. **Fracture Mechanics, Evaluation of Domestic RPVs:**

- a. RES will provide NRR with technical assistance to review and/or perform analyses to assess the implications of the NDE indications similar to Doel 3 if postulated to exist in similar domestic RPV ring forgings. It is anticipated that the U.S. nuclear industry may perform both structural and fracture mechanics analyses of RPV forgings postulated to contain indications similar to those discovered in Doel 3. If the industry performs these analyses, RES will perform confirmatory analyses in support of NRR's review. In the event that industry does not perform these analyses in a timeframe suitable to NRR, RES will support NRR by assessing the adequacy of current ASME Section III acceptance criteria for (b)(4). It is anticipated that this assessment will include structural analysis as well as deterministic and/or probabilistic fracture mechanics analyses.
- b. **Schedule:** The schedule will be determined based on the availability of information from Belgium, timeframe for completion of the assessment by the U.S. nuclear industry, and on NRC prioritization. RES understands that this is a high priority matter and will work with NRR to expedite the needed work.
- c. **Deliverables:** Support via e-mail, telephone, and meetings are anticipated. Topical reports and/or memoranda can be prepared as needed.
- d. **RES Point of Contact:** Gary Stevens, RES/DE/CIB, [gary.stevens@nrc.gov](mailto:gary.stevens@nrc.gov)

P. Hiland

- 3 -

Due to lack of information, there is considerable uncertainty regarding the level of effort needed to support this work. Below is the initial estimate to complete this effort:

1. NDE: 80 staff hours
2. Fracture Mechanics, Support of FANC: 100 staff hours
3. Fracture Mechanics, Evaluation of Domestic RPVs: 120 staff hours will be needed for a review of an analysis performed by the industry. If the industry does not perform an analysis, 0.5 FTE will be needed to perform the requested evaluations. Overall, 300 staff hours (approximately 0.2 FTE) are needed to respond to tasks 1, 2, and 3.

Also, contractor support may be needed (e.g., Pacific Northwest National Laboratory, Oak Ridge National Laboratory, etc.) depending on the constraints imposed by the overall scope of work and schedule.

Enclosures:

1. NRR Request for Assistance, ADAMS [ML12242A258](#)
2. FANC Request for Assistance, ADAMS [ML12242A335](#)

P. Hiland

- 3 -

Due to lack of information, there is considerable uncertainty regarding the level of effort needed to support this work. Below is the initial estimate to complete this effort:

4. NDE: 80 staff hours
5. Fracture Mechanics, Support of FANC: 100 staff hours
6. Fracture Mechanics, Evaluation of Domestic RPVs: 120 staff hours will be needed for a review of an analysis performed by the industry. If the industry does not perform an analysis, 0.5 FTE will be needed to perform the requested evaluations. Overall, 300 staff hours (approximately 0.2 FTE) are needed to respond to tasks 1, 2, and 3.

Also, contractor support may be needed (e.g., Pacific Northwest National Laboratory, Oak Ridge National Laboratory, etc.) depending on the constraints imposed by the overall scope of work and schedule.

Enclosures:

3. NRR Request for Assistance, ADAMS ML12242A258
1. FANC Request for Assistance, ADAMS ML12242A335

**DISTRIBUTION:**

|                       |                        |                   |
|-----------------------|------------------------|-------------------|
| DE/rf                 | Gary Stevens, RES      | Mike Benson, RES  |
| Eric Focht, RES       | Carol Nove, RES        | Stu Richards, RES |
| Bob Hardies, NRR      | Mike Cheek, NRR        | Jeff Poehler, NRR |
| Stacey Rosenberg, NRR | Carolyn Fairbanks, NRR |                   |

**ADAMS Pkg. Accession No.: ML12242A333**

| OFFICE | RES/DE/CIB | RES/DE/CIB | RES/DE                  |
|--------|------------|------------|-------------------------|
| NAME   | M. Kirk    | A. Csontos | S. Richards for M. Case |
| DATE   | 8/31/12    | 9/4/12     | 9/6/12                  |

**OFFICIAL RECORD COPY**

**Failla, David**

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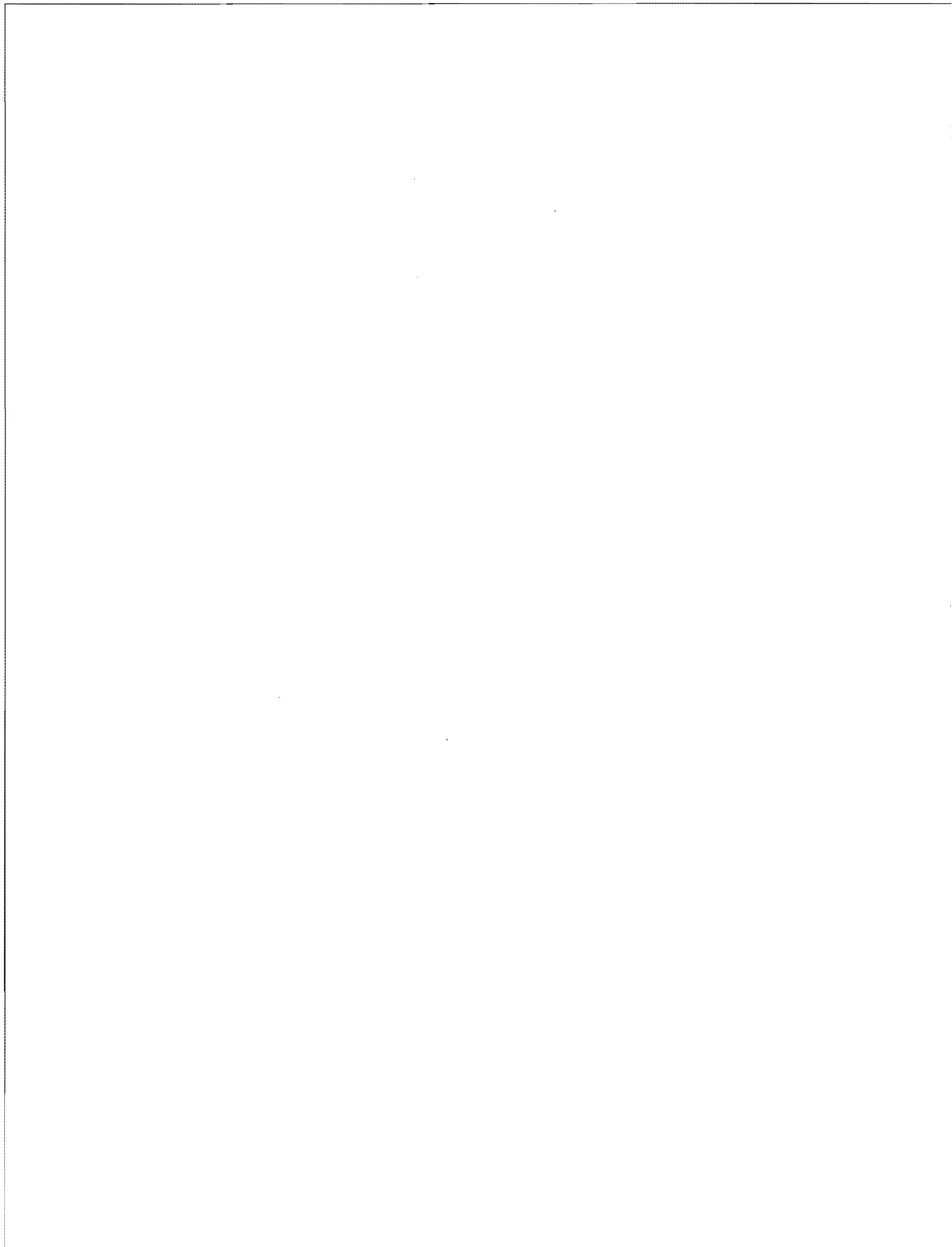
**From:** Brown, Frederick  
**Sent:** Thursday, September 06, 2012 4:41 PM  
**To:** Failla, David  
**Attachments:** NucleonicsWeek.pdf

Pretty good article on the bottom of page 1, continuing on page 8.

## **COPYRIGHT MATERIAL**

**There were 11 pages attached to this email which are being denied under copyright law.**

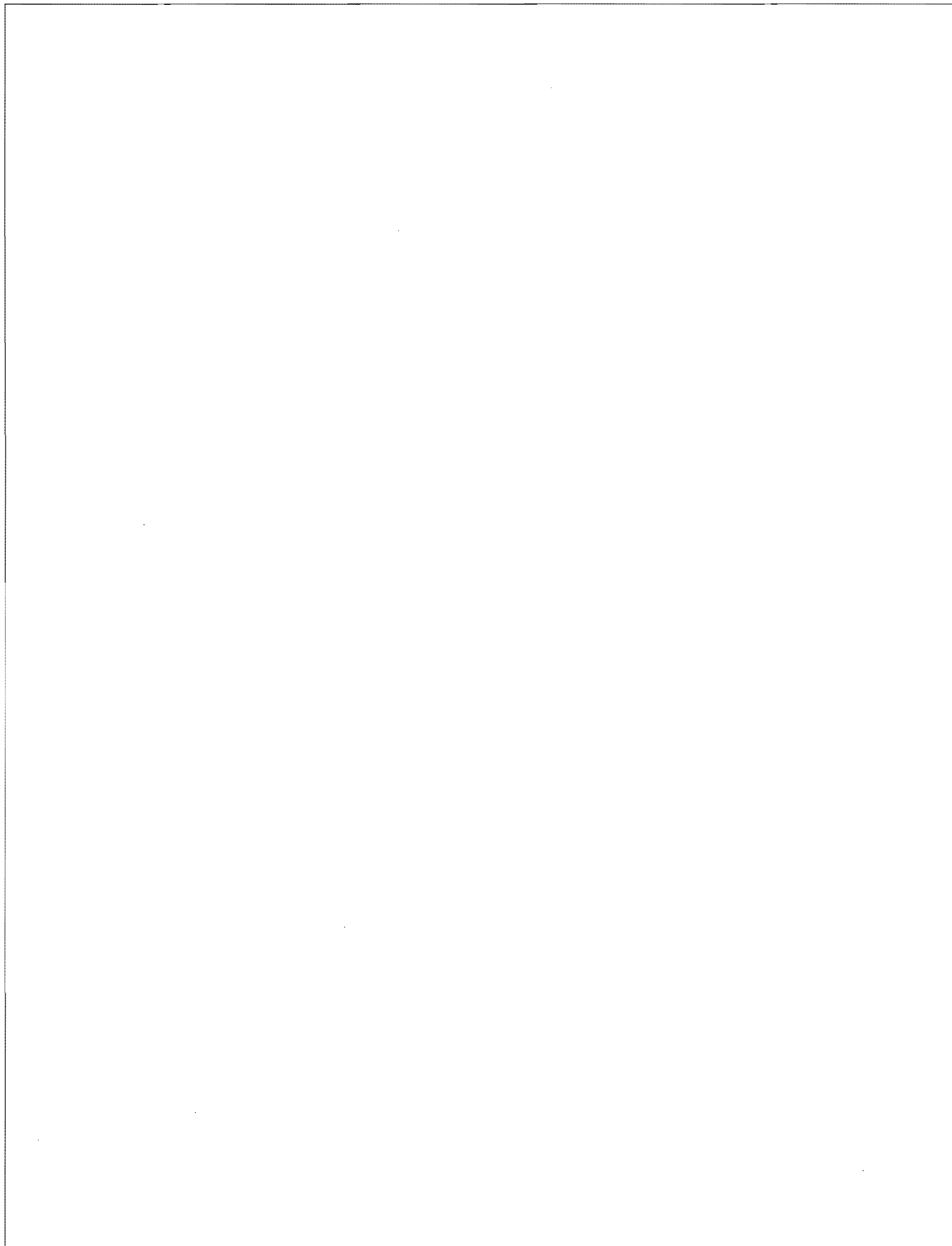


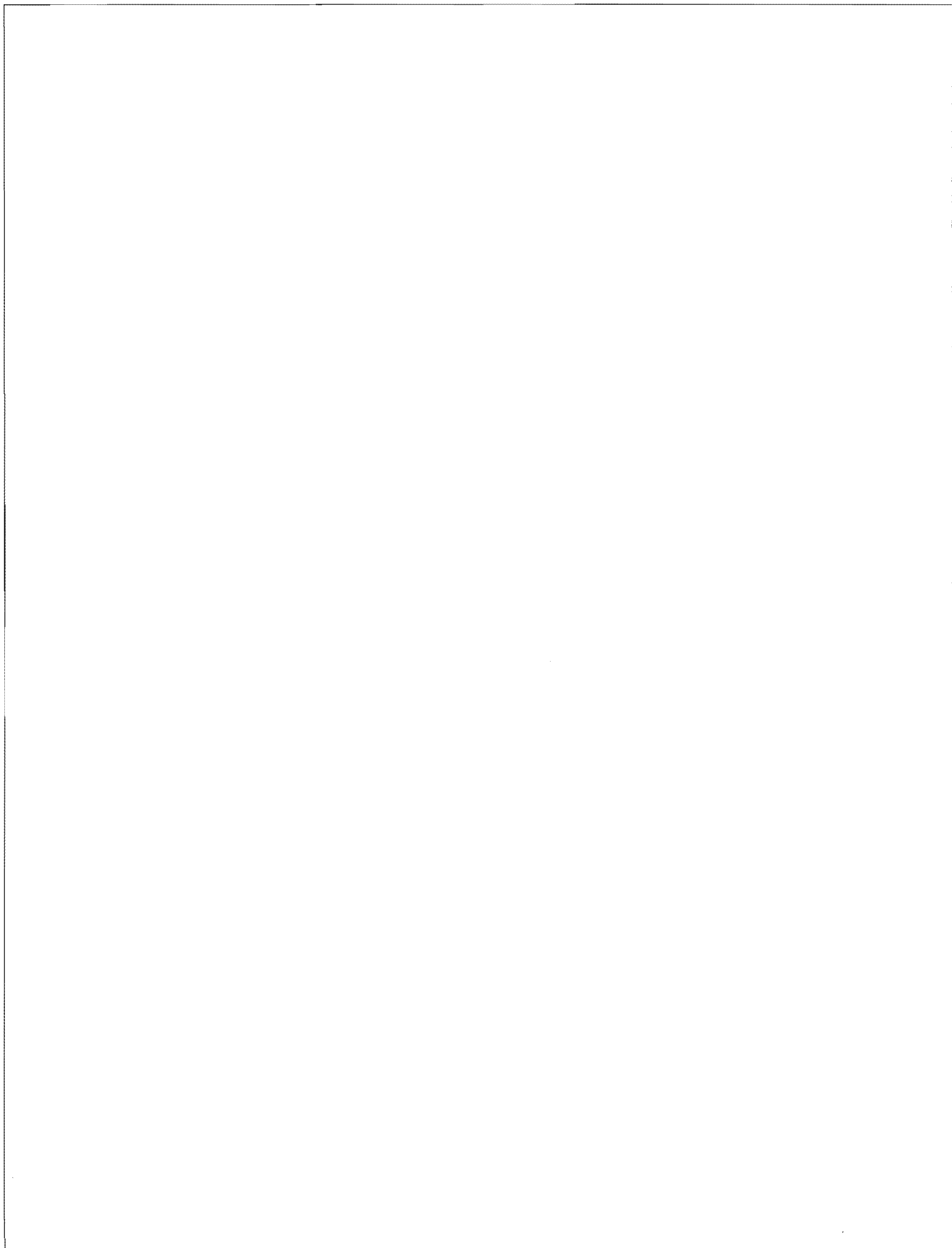




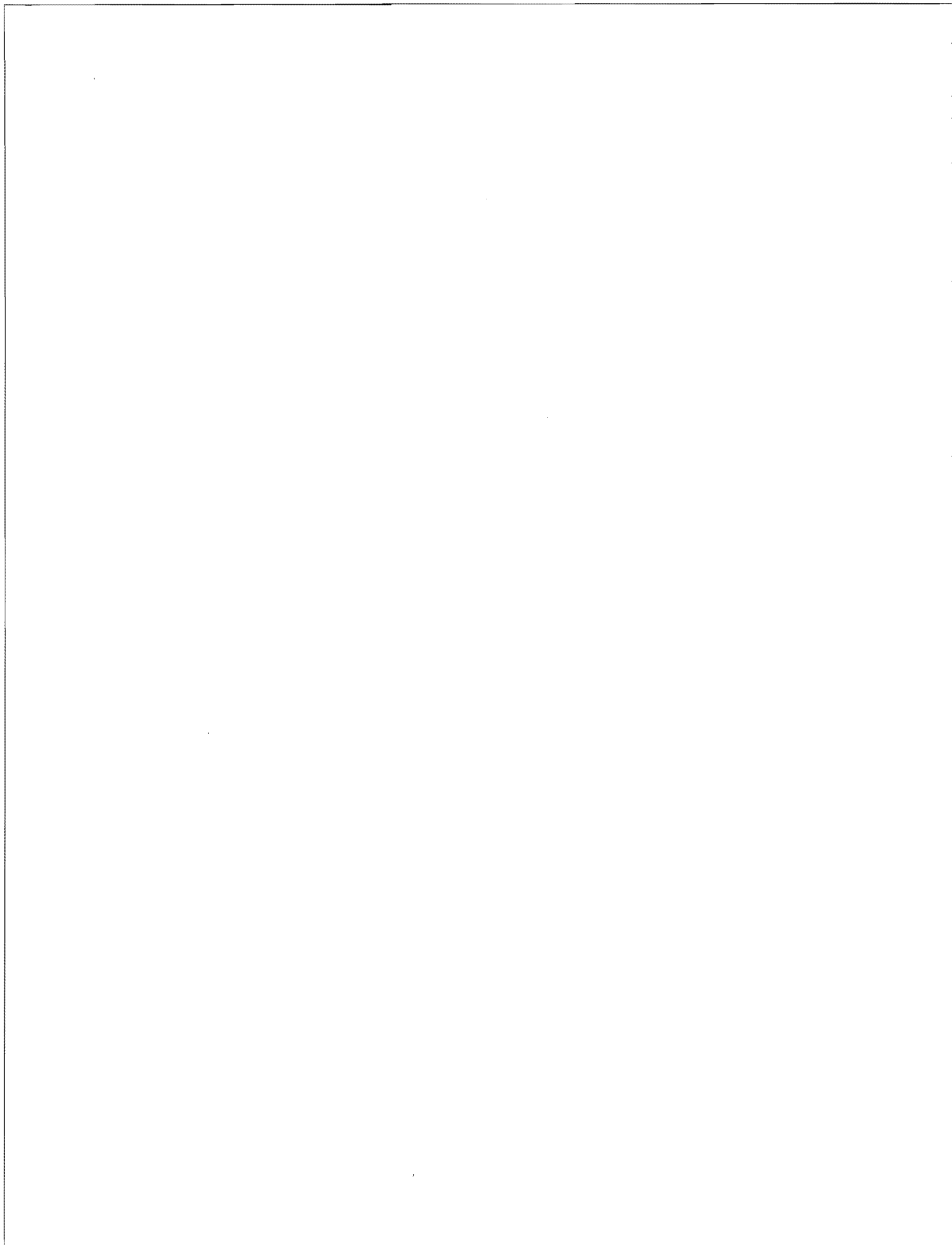


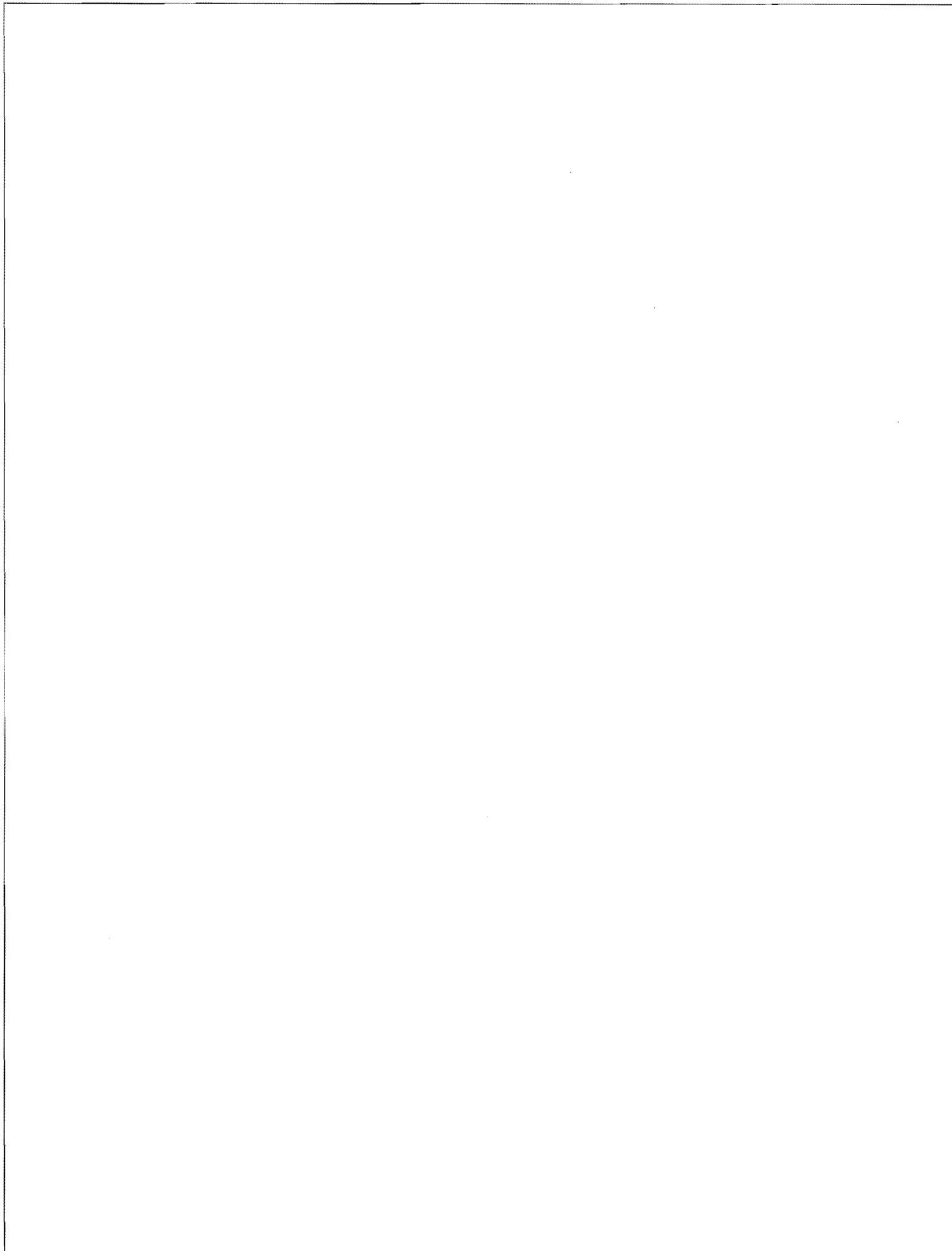


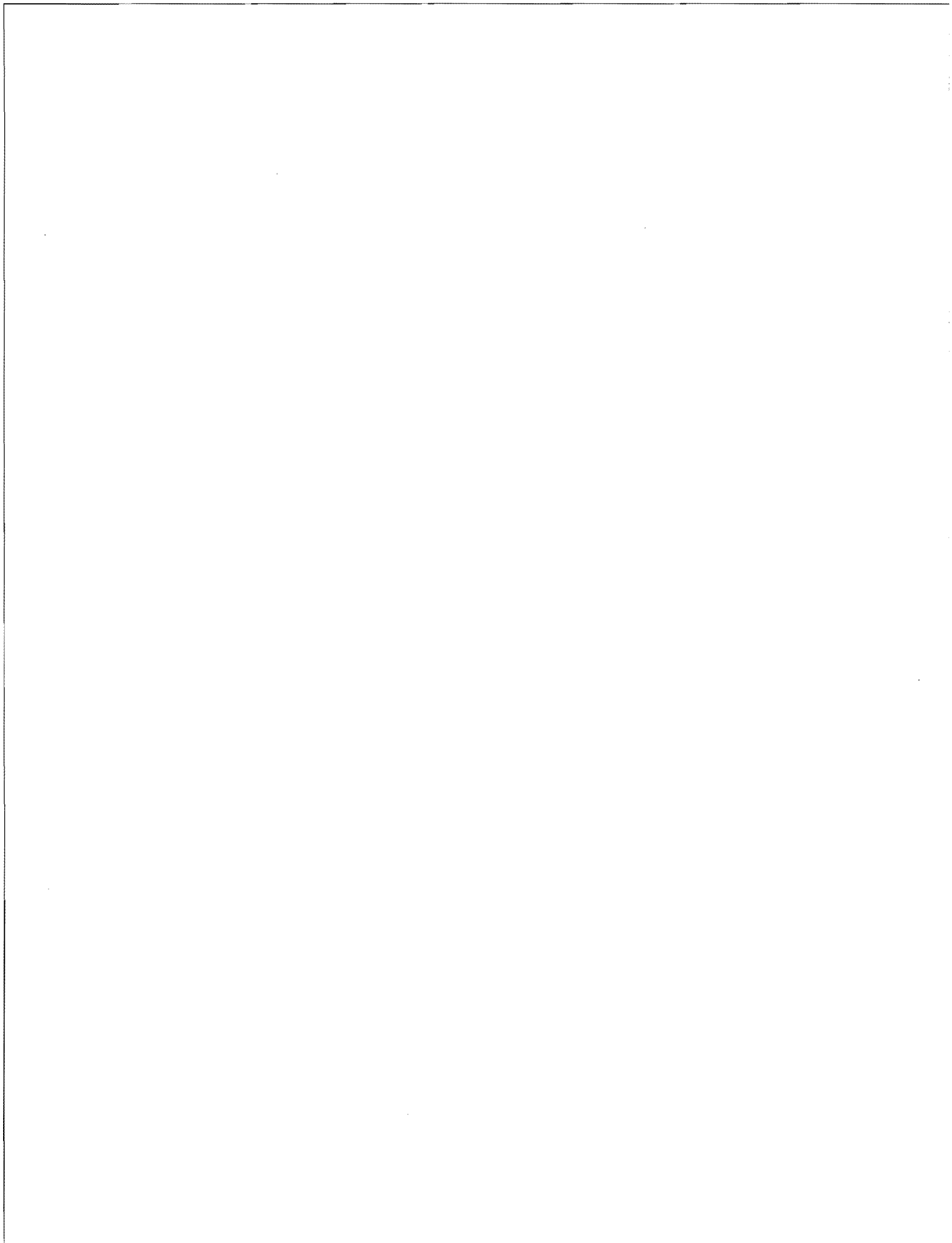


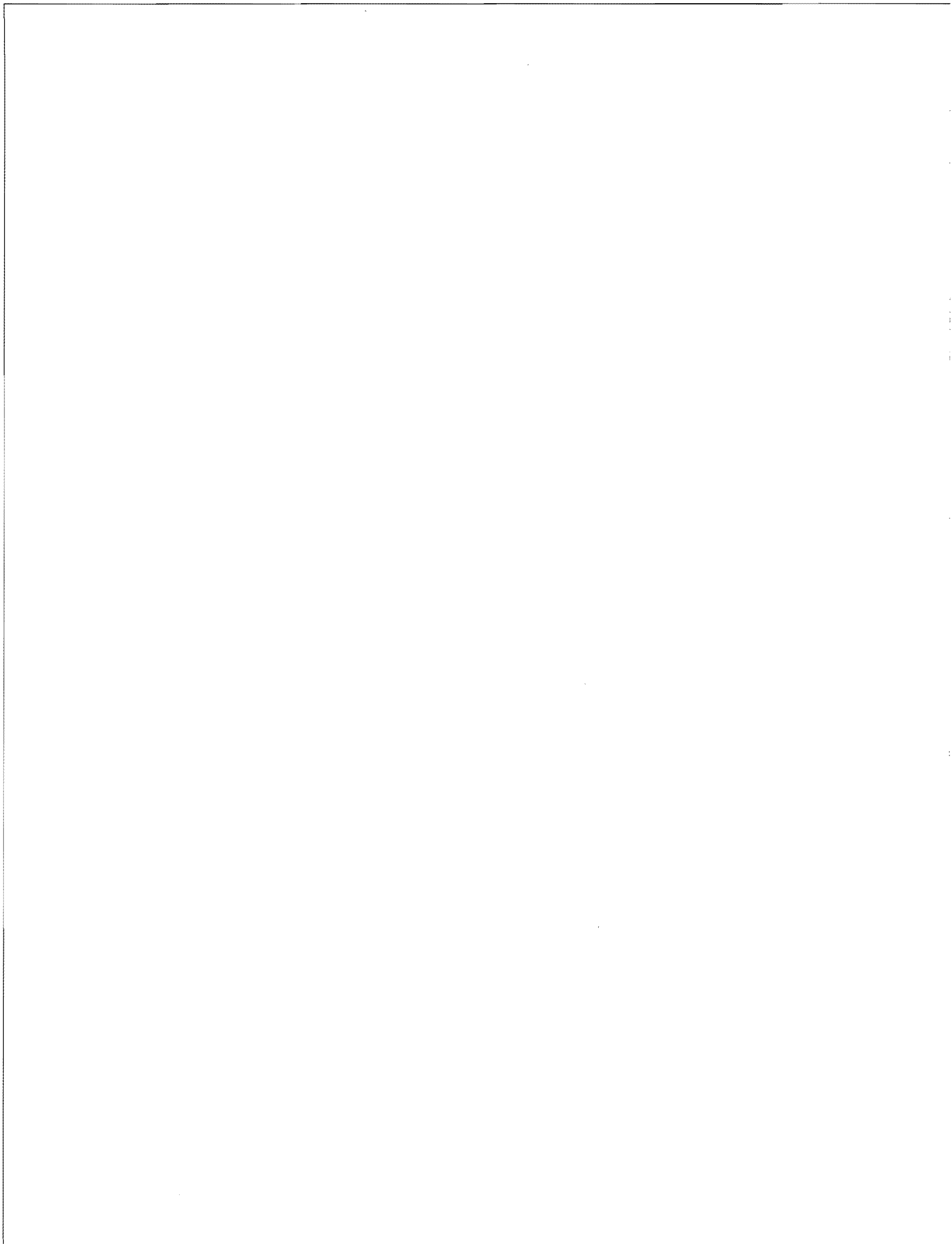














Lupold, Timothy

209.

**From:** Hardies, Robert *in*  
**Sent:** Thursday, September 06, 2012 1:01 PM  
**To:** Cheok, Michael; Hiland, Patrick; Case, Michael  
**Cc:** Rosenberg, Stacey; Fairbanks, Carolyn; Csontos, Aladar; Lupold, Timothy  
**Subject:** FW: Doel 3 RPV Issue: Terms of Reference & Next meeting  
**Attachments:** 2012-09-06 Terms of Reference Doel 3.docx

The three working groups for reviewing the Doel indications are being formed. The first meeting is proposed for October 16. There are three groups in parallel sessions. I propose that we populate each group. I also propose the groups be comprised of the following people:

|         |                       |                                                                                                                                                                                                                                         |
|---------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group 1 | NDE                   | Carol Nove, RES or Steve Cumblidge                                                                                                                                                                                                      |
| Group 2 | Metallurgy root cause | Bob Hardies or Jeff Poehler                                                                                                                                                                                                             |
| Group 3 | Fracture mechanics    | Mark Kirk, RES or Gary Stevens, RES (I am not sure whether this is another group or the same group that Mark has already been invited to join, and if this is another group we may not need to support. I have asked for clarification) |

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

**From:** VAN WONTERGHEM Frederik [<mailto:Frederik.VANWONTERGHEM@FANC.FGOV.BE>]  
**Sent:** Thursday, September 06, 2012 11:08 AM  
**To:** [jean-luc.lachaume@asn.fr](mailto:jean-luc.lachaume@asn.fr); [francois.balestreri@irsn.fr](mailto:francois.balestreri@irsn.fr); [Sebastien.CROMBEZ@asn.fr](mailto:Sebastien.CROMBEZ@asn.fr); [gerard.cattiaux@irsn.fr](mailto:gerard.cattiaux@irsn.fr); [adrien.thibault@asn.fr](mailto:adrien.thibault@asn.fr); [laurent.streibig@asn.fr](mailto:laurent.streibig@asn.fr); [bernard.monnot@irsn.fr](mailto:bernard.monnot@irsn.fr); [marc.pic@asn.fr](mailto:marc.pic@asn.fr); [Klaus.Germerdonk@ensi.ch](mailto:Klaus.Germerdonk@ensi.ch); Ryf Martin; Hardies, Robert; [lutz.lindhorst@ilent.nl](mailto:lutz.lindhorst@ilent.nl); Wiel, ir. L. van der; [C.Hoogwerf@mineleni.nl](mailto:C.Hoogwerf@mineleni.nl); [erik.zeelenberg@lr.org](mailto:erik.zeelenberg@lr.org); [Thomas.Schimpfke@grs.de](mailto:Thomas.Schimpfke@grs.de); [Mihdi.Elmas@grs.de](mailto:Mihdi.Elmas@grs.de); [bsf@csn.es](mailto:bsf@csn.es); [amb@csn.es](mailto:amb@csn.es); [stephen.druce@hse.gsi.gov.uk](mailto:stephen.druce@hse.gsi.gov.uk); [Tony.Wooldridge@hse.gsi.gov.uk](mailto:Tony.Wooldridge@hse.gsi.gov.uk); [John.Highton@hse.gsi.gov.uk](mailto:John.Highton@hse.gsi.gov.uk); [Gareth.Hopkin@hse.gsi.gov.uk](mailto:Gareth.Hopkin@hse.gsi.gov.uk); [Richard.Sundberg@ssm.se](mailto:Richard.Sundberg@ssm.se); [Lars.Skanberg@ssm.se](mailto:Lars.Skanberg@ssm.se); [Michel.bieth@ec.europa.eu](mailto:Michel.bieth@ec.europa.eu); [benoit.zerger@ec.europa.eu](mailto:benoit.zerger@ec.europa.eu); [Bernhard.ELSING@ec.europa.eu](mailto:Bernhard.ELSING@ec.europa.eu); [igor.simonovski@ec.europa.eu](mailto:igor.simonovski@ec.europa.eu); [Ralf.ahlstrand@ec.europa.eu](mailto:Ralf.ahlstrand@ec.europa.eu); [Nancy.SALGADO@oecd.org](mailto:Nancy.SALGADO@oecd.org); Politi Adriana; [K-S.Kang@iaea.org](mailto:K-S.Kang@iaea.org)  
**Cc:** WERTELAERS An; SCHRAUBEN Manfred; DE ROOVERE Willy; TOMBUYES Beatrice; OULIDDREN Kamreddine; CREEMERS Joris; POULEUR Yvan; [pierre.barras@belv.be](mailto:pierre.barras@belv.be); [pierre.briegleb@belv.be](mailto:pierre.briegleb@belv.be); [henri.drymael@belv.be](mailto:henri.drymael@belv.be); [simon.hoebeeck@belv.be](mailto:simon.hoebeeck@belv.be); [guy.roussel@Belv.be](mailto:guy.roussel@Belv.be); Deledicque Vincent; Deprez Marc; [aweyn@vincotte.be](mailto:aweyn@vincotte.be); [hvandiessche@vincotte.be](mailto:hvandiessche@vincotte.be); [drozanski@vincotte.be](mailto:drozanski@vincotte.be); [fvanherck@vincotte.be](mailto:fvanherck@vincotte.be); [william.dhaeseleer@mech.kuleuven.be](mailto:william.dhaeseleer@mech.kuleuven.be); [yves.vandenberghe@belv.be](mailto:yves.vandenberghe@belv.be)  
**Subject:** Doel 3 RPV Issue: Terms of Reference & Next meeting

Dear all,

In attachment you can find a proposal for "Terms of Reference" for the 3 working groups that were announced during the technical workshop of August 16<sup>th</sup> on the Doel RPV issue.

These terms of reference give an overview of the topics and licensee documents that could be discussed in these working groups (FYI: the numbering of working groups 2 and 3 has been reversed).

- Working group 1 : Non-destructive Examination techniques

- Working group 2: Metallurgical origin / root causes of the flaw indications
- Working group 3: Structural mechanics & fracture mechanics – Approach for justification file

Taking into account the expected timing for some key documents we've requested from the licensee (some documents only available at the end of September), the first meeting of the 3 expert working groups will take place on **Tuesday 16<sup>th</sup> October** in Brussels (1-day meeting). The exact timing, location and agenda for this meeting will be sent to you as soon as possible.

During this meeting, after a common introduction, each working group will start their discussions in separate sessions.

The confirmed participants to each working group are also included in the Terms of Reference.

Additional participants to these working groups are of course welcome. Please send the following information for participants from your organisation for each working group: name, organisation, function, email & mobile phone, area of expertise to Mr. Joris Creemers ([joris.creemers@fanc.fgov.be](mailto:joris.creemers@fanc.fgov.be) +32 2 289 2168) who will be responsible for the practical organisation of the meeting of Tuesday 16<sup>th</sup> October.

Best regards,

Frederik Van Wonterghem

FEDERAL AGENCY FOR NUCLEAR CONTROL

Ravensteinstraat 36, 1000 Brussel

[www.fanc.fgov.be](http://www.fanc.fgov.be)

Tel.: +32 (0)2 289 20 82

Fax: +32 (0)2 289 21 12

**FANC & AFCN**

Fédération Belge des Ingénieurs et des Radiateurs de Contrôle

Association Belge des Ingénieurs et des Radiateurs de Contrôle

Het FANC is ISO 9001:2008 gecertificeerd – L'AFCN est certifiée ISO 9001:2008.

Aub, dank aan het milieu voordat u deze mail uitprint.

Svp, pensez à notre environnement avant d'imprimer ce mail.

Disclaimer (Fr) - Disclaimer (NL)

(b)(4)

(b)(4)

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(b)(4)

(b)(4)



(b)(4)

A - 18

**Kusnick, Joshua**

---

**From:** Csontos, Aladar  
**Sent:** Monday, September 10, 2012 1:48 PM  
**To:** Gery Wilkowski; Hardies, Robert  
**Cc:** Prabhat Krishnaswamy  
**Subject:** RE: North Anna Meeting

It's a public meeting so anyone can attend. The crux of the discussion will be NDE though. FYI.

**From:** Gery Wilkowski [<mailto:gwilkows@emc-sq.com>]  
**Sent:** Monday, September 10, 2012 1:47 PM  
**To:** Csontos, Aladar; Hardies, Robert  
**Cc:** Prabhat Krishnaswamy  
**Subject:** North Anna Meeting

Good afternoon Al and Bob:

I will happen to be at NRC tomorrow and Wednesday morning. Is it OK for me to attend the North Anna public meeting to see how our work played out in the eventual results? I will probably be able to be there in the afternoon. Prabhat might be with me too.

Thanks,

Gery

p.s. I have been asked to be on the Doel 3 expert review committee, which may meet in Belgium in November.

\*\*\*\*\*  
Dr. Gery M. Wilkowski, P.E.  
President  
Engineering Mechanics Corporation of Columbus  
3518 Riverside Drive -- Suite 202  
Columbus, OH 43221  
Phone/Fax (614) 459-3200/6800  
Cell phone # (b)(6)  
web-page: [www.emc-sq.com](http://www.emc-sq.com)  
E-mail address: [gwilkowski@emc-sq.com](mailto:gwilkowski@emc-sq.com)  
\*\*\*\*\*

A-23

**Kusnick, Joshua**

---

**From:** Csontos, Aladar  
**Sent:** Tuesday, September 11, 2012 9:05 PM  
**To:** Richards, Stuart; Case, Michael  
**Subject:** Re: Request for Approval of Foreign Travel to attend Doel Technical Work Groups

Much better!!!

---

**From:** Richards, Stuart  
**To:** Csontos, Aladar; Case, Michael  
**Sent:** Tue Sep 11 16:50:04 2012  
**Subject:** Request for Approval of Foreign Travel to attend Doel Technical Work Groups

Your thoughts on the draft below - Stu

DRAFT

-----  
Brian/Jennifer

Example 5  
see decision

(b)(5)

(b)(5)

Stu

A-25  
**Kusnick, Joshua**

---

**From:** Csontos, Aladar  
**Sent:** Tuesday, September 11, 2012 2:31 PM  
**To:** West, Stephanie  
**Subject:** FW: RES response to research assistance request NRR-2012-005.doc  
**Attachments:** 2012-08-30 - RES response to research assistance request NRR-2012-005.doc

-----Original Message-----

**From:** Kirk, Mark  
**Sent:** Thursday, August 30, 2012 3:55 PM  
**To:** West, Stephanie  
**Cc:** Dion, Jeanne; Csontos, Aladar; Stevens, Gary; Nove, Carol; Kirk, Mark  
**Subject:** RES response to research assistance request NRR-2012-005.doc

Stephanie -

The attached letter is in reply to the e-mail chain below. Could you please check my formatting and circulate this as a concurrence package?

Please let me know if you need further information.

Thanks,

mark

---

**From:** Johnson, Kevin  
**To:** Dion, Jeanne  
**Cc:** Rini, Brett; Csontos, Aladar  
**Sent:** Tue Aug 28 10:52:19 2012  
**Subject:** RE: Research Assistance Request Good Morning!

A new action has been assigned to your Division:

ATMIS: 2012558

**Subject:** Research Assistance Request to assess the implications of the indications discovered in the Doel 3 reactor pressure vessel forgings to domestic reactor pressure vessel forgings NRR-2012-005 (RAR)

Update the FO - 9/18/2012

Please forward Patrick Hiland email to your division AAs to add to ADAMS, that will be considered our incoming for the record.

Thank you.

Kevin

One Team/One Goal

Kevin D. Johnson  
Research Information Specialist  
Office of Nuclear Regulatory Research  
RES/PMDA/HCCB  
Email: [Kevin.Johnson@nrc.gov](mailto:Kevin.Johnson@nrc.gov)  
O6AO6a  
Office: 301-251-7665  
Cell: (b)(6)

From: Dion, Jeanne  
Sent: Tuesday, August 28, 2012 8:21 AM  
To: Johnson, Kevin  
Cc: Rini, Brett; Csontos, Aladar  
Subject: FW: Research Assistance Request

Hi Kevin,  
Can you please ticket DE/Al Csontos to formulate an email response regarding NRR's research assistance request by September 18th?  
The email will be from Mike Case to Pat Hiland.

Thanks,  
Jeanne Dion  
Technical Assistant  
U.S. Nuclear Regulatory Commission  
Office of Nuclear Regulatory Research  
Division of Engineering  
[Jeanne.dion@nrc.gov](mailto:Jeanne.dion@nrc.gov)  
301-251-7482

From: Case, Michael  
Sent: Tuesday, August 28, 2012 7:20 AM  
To: Dion, Jeanne  
Cc: Rini, Brett; Sheron, Brian; Uhle, Jennifer; Richards, Stuart; Csontos, Aladar  
Subject: FW: Research Assistance Request

Hi Jeanne. Can you work with the front office and ticket this back to us (CIB) for a response. Since it's a RAR, we can respond at the division level.

From: Hiland, Patrick  
Sent: Monday, August 27, 2012 3:42 PM  
To: Case, Michael  
Cc: Richards, Stuart; Fairbanks, Carolyn; Rosenberg, Stacey; Cheok, Michael; Hardies, Robert; Dorman, Dan; Boger, Bruce; Evans, Michele  
Subject: Research Assistance Request

The Office of Nuclear Reactor Regulation (NRR), Division of Engineering is requesting that the Office of Nuclear Regulatory Research (RES), Division of Engineering provide research assistance to assess the implications of the indications discovered in the Doel 3 reactor pressure vessel forgings to domestic reactor pressure vessel forgings. Specifically, NRR is requesting technical assistance in the areas of nondestructive examination (NDE) and deterministic and probabilistic fracture mechanics

In the area of NDE, NRR request technical expertise to assess the procedures, techniques, equipment, standards, qualifications, inspections, acceptance criteria and other relevant NDE variables used to examine the Doel 3 reactor pressure vessel forgings. This assistance may include contact with the licensee (Doel 3), the Belgian nuclear regulatory authority and possibly contractors. Travel to Belgium may also be necessary.

In the area of fracture mechanics, NRR requests assistance to support the Belgian regulator, FANC. FANC has requested the participation of Dr. Mark Kirk in an expert peer review panel. The peer review panel would assist the regulator in assessing the deterministic and probabilistic fracture mechanics analyses being prepared by the licensee for Doel 3. Telephone, video conference, and in-person meetings in Belgium would likely be necessary for this effort.

Also in the area of fracture mechanics, NRR requests assistance to perform analyses related to the implications of similar indications (to Doel 3) in domestic reactor pressure vessel forgings. This effort is currently less well defined. The industry has proposed performing both deterministic and probabilistic fracture mechanics analyses of generic reactor pressure vessel forgings with indications similar to those discovered in Doel 3. If the industry performs these analyses, RES would perform confirmatory analyses. In the event that industry did not perform analyses of hypothetically flawed vessels, this request would be for RES to perform research to verify the adequacy of current ASME Section III acceptance criteria for laminar flaws in reactor pressure vessel forgings by performing appropriate deterministic or probabilistic fracture mechanics analyses.

A-26

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Wednesday, September 12, 2012 6:16 PM  
**To:** DePaula, Sara  
**Subject:** FW: Research Assistance Request

Sara,

(b)(5)

**From:** Case, Michael  
**Sent:** Tuesday, August 28, 2012 7:20 AM  
**To:** Dion, Jeanne  
**Cc:** Rini, Brett; Sheron, Brian; Uhle, Jennifer; Richards, Stuart; Csontos, Aladar  
**Subject:** FW: Research Assistance Request

Hi Jeanne. Can you work with the front office and ticket this back to us (CIB) for a response. Since it's a RAR, we can respond at the division level.

**From:** Hiland, Patrick  
**Sent:** Monday, August 27, 2012 3:42 PM  
**To:** Case, Michael  
**Cc:** Richards, Stuart; Fairbanks, Carolyn; Rosenberg, Stacey; Cheok, Michael; Hardies, Robert; Dorman, Dan; Boger, Bruce; Evans, Michele  
**Subject:** Research Assistance Request

The Office of Nuclear Reactor Regulation (NRR), Division of Engineering is requesting that the Office of Nuclear Regulatory Research (RES), Division of Engineering provide research assistance to assess the implications of the indications discovered in the Doel 3 reactor pressure vessel forgings to domestic reactor pressure vessel forgings. Specifically, NRR is requesting technical assistance in the areas of nondestructive examination (NDE) and deterministic and probabilistic fracture mechanics



In the area of NDE, NRR request technical expertise to assess the procedures, techniques, equipment, standards, qualifications, inspections, acceptance criteria and other relevant NDE variables used to examine the Doel 3 reactor pressure vessel forgings. This assistance may include contact with the licensee (Doel 3), the Belgian nuclear regulatory authority and possibly contractors. Travel to Belgium may also be necessary.

In the area of fracture mechanics, NRR requests assistance to support the Belgian regulator, FANC. FANC has requested the participation of Dr. Mark Kirk in an expert peer review panel. The peer review panel would assist the regulator in assessing the deterministic and probabilistic fracture mechanics analyses being prepared by the licensee for Doel 3. Telephone, video conference, and in-person meetings in Belgium would likely be necessary for this effort.

Also in the area of fracture mechanics, NRR requests assistance to perform analyses related to the implications of similar indications (to Doel 3) in domestic reactor pressure vessel forgings. This effort is currently less well defined. The industry has proposed performing both deterministic and probabilistic fracture mechanics analyses of generic reactor pressure vessel forgings with indications similar to those discovered in Doel 3. If the industry performs these analyses, RES would perform confirmatory analyses. In the event that industry did not perform analyses of hypothetically flawed vessels, this request would be for RES to perform research to verify the adequacy of current ASME Section III acceptance criteria for laminar flaws in reactor pressure vessel forgings by performing appropriate deterministic or probabilistic fracture mechanics analyses.

17  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Thursday, September 13, 2012 1:53 PM  
**To:** Hardies, Robert  
**Subject:** RE: Large NSSS Component Fabrication and Inspection

ok

**From:** Hardies, Robert  
**Sent:** Thursday, September 13, 2012 1:53 PM  
**To:** Csontos, Aladar  
**Subject:** RE: Large NSSS Component Fabrication and Inspection

I don't have it in electronic format. That would take a few hours. Not before Monday.

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

**From:** Csontos, Aladar  
**Sent:** Thursday, September 13, 2012 1:34 PM  
**To:** Hardies, Robert  
**Subject:** FW: Large NSSS Component Fabrication and Inspection

Can you send your canned slides to them as well as the Doel releasable information?

**From:** Brown, Christopher  
**Sent:** Thursday, September 13, 2012 11:58 AM  
**To:** Csontos, Aladar  
**Subject:** RE: Large NSSS Component Fabrication and Inspection

Can you send me the slides from the Commission briefing? Perhaps this is all the Committee might want to hear. Got an Email in to Dana and Ed on this issue.

**From:** Csontos, Aladar  
**Sent:** Tuesday, September 11, 2012 10:54 AM  
**To:** Hackett, Edwin; Case, Michael  
**Cc:** Kirk, Mark; Tregoning, Robert; Santos, Cayetano; Dias, Antonio; Brown, Christopher  
**Subject:** Re: Large NSSS Component Fabrication and Inspection

Ed,

Would this be for the full committee or materials sub-committee?

Thanks,  
Al

---

**From:** Hackett, Edwin  
**To:** Case, Michael; Csontos, Aladar  
**Cc:** Kirk, Mark; Tregoning, Robert; Santos, Cayetano; Dias, Antonio; Brown, Christopher  
**Sent:** Tue Sep 11 10:46:14 2012  
**Subject:** Large NSSS Component Fabrication and Inspection

Mike, Al,

The Members had a discussion at the Sept. Meeting on the recent vessel flaw findings at Doel. This led to an appreciation of the fact that they not had a briefing in this area (Large NSSS Component Fabrication and Inspection) for quite some time (probably not since the last PTS discussion).

Would you guys be able to pull together an information briefing for the October ACRS Meeting (Oct. 4-5) on the latest that is going on in large section steel fabrication and inspection? The Members were particularly interested in the International perspective, since all or most of this fabrication will be taking place outside the U.S.

We will also want to include NRR and NRO on this, but I would like to get your perspectives first.

I realize that this is very short notice – if it helps, this could be viewed as an initial briefing (1 hour) with more to follow in the future.

Thanks,

Ed

1  
7-42  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Thursday, September 13, 2012 4:56 PM  
**To:** Hackett, Edwin; Brown, Christopher  
**Cc:** Santos, Cayetano; Bellinger, Alesha; Dias, Antonio  
**Subject:** RE: recent vessel flaw findings at Doel.

Thursday is best and Bob Hardies agreed to the Doel presentation.

-----Original Message-----

**From:** Hackett, Edwin  
**Sent:** Thursday, September 13, 2012 3:06 PM  
**To:** Csontos, Aladar; Brown, Christopher  
**Cc:** Santos, Cayetano; Bellinger, Alesha; Dias, Antonio  
**Subject:** RE: recent vessel flaw findings at Doel.

Thanks Al. We will list it as a one hour closed information session.

Chris/Antonio - please modify the agenda accordingly. Lets title it "RPV fabrication and flaw assessment".

Not sure which day works better?

Al - do you have a preference for Thursday or Friday?

Ed

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**From:** Csontos, Aladar  
**Sent:** Thursday, September 13, 2012 2:58 PM  
**To:** Hackett, Edwin; Brown, Christopher  
**Cc:** Santos, Cayetano; Bellinger, Alesha  
**Subject:** RE: recent vessel flaw findings at Doel.

Sounds good. Just sent the email out to NRR and NRO. Bob seemed to think it shouldn't be a problem. Can we ensure that the session is closed to the public for the Doel presentation?

-----Original Message-----

**From:** Hackett, Edwin  
**Sent:** Thursday, September 13, 2012 2:39 PM  
**To:** Csontos, Aladar; Brown, Christopher  
**Cc:** Santos, Cayetano; Bellinger, Alesha  
**Subject:** RE: recent vessel flaw findings at Doel.

Thanks Al. We are overdue on sending the agenda out. We would like to issue it tomorrow. I would propose that we show something like reactor vessel fabrication and flaw assessment for an hour. That way we can do Doel for sure and add DCIP if they can support. Ok with you?

---

**From:** Csontos, Aladar  
**Sent:** Thursday, September 13, 2012 2:29 PM  
**To:** Hackett, Edwin; Brown, Christopher  
**Cc:** Santos, Cayetano; Bellinger, Alesha  
**Subject:** RE: recent vessel flaw findings at Doel.

The cognizant person in NRO is out on an inspection this week. I should know by Monday or Tuesday. Is that OK?

-----Original Message-----

From: Hackett, Edwin  
Sent: Thursday, September 13, 2012 2:26 PM  
To: Csontos, Aladar; Brown, Christopher  
Cc: Santos, Cayetano; Bellinger, Alesha  
Subject: RE: recent vessel flaw findings at Doel.

Sounds good Al. I think that would work great. Can you all pull it together in time for the Oct. Meeting?

---

From: Csontos, Aladar  
Sent: Thursday, September 13, 2012 2:21 PM  
To: Hackett, Edwin; Brown, Christopher  
Cc: Santos, Cayetano; Bellinger, Alesha  
Subject: RE: recent vessel flaw findings at Doel.

Ok. Then how about 1) 30 minutes: Doel - NRR/DE (Bob Hardies) which will be closed due to non-publically releasable information and 2) 30 minutes: New Fabrication and inspection - NRO/DCIP. The latter should be an open public meeting.

The Doel brief is done, but, not in electronic form. I confirmed this with Bob this AM. He could have the Doel brief done in electronic form by Monday. So, we can do the Doel brief since Bob has given it several times to Commissioners and such.

-----Original Message-----

From: Hackett, Edwin  
Sent: Thursday, September 13, 2012 2:16 PM  
To: Brown, Christopher; Csontos, Aladar  
Cc: Santos, Cayetano; Bellinger, Alesha  
Subject: RE: recent vessel flaw findings at Doel.

Thanks Chris.

Al, if it helps, we could break this into two pieces - 1. Doel and 2. New fabrication and inspection. If it might take longer to get a Doel briefing together, we could always just do a general new fab and construction briefing first.

Ed

---

From: Brown, Christopher  
Sent: Thursday, September 13, 2012 12:08 PM  
To: Csontos, Aladar  
Cc: Hackett, Edwin; Santos, Cayetano  
Subject: recent vessel flaw findings at Doel.

Al,

In talking with my colleagues in the ACRS, it appears that Dana just wanted a general information briefing. Nothing special. I am thinking that the Commission briefing slides might be perfect with a little bit more technical meat added. (of course, I have not seen the slides) I will discuss with Ed.

Also, you mentioned that you had other information concerning the issue that was proprietary. We can always close a portion of the meeting to discuss proprietary information.

It is understood that NRO's vendor inspection branch has the lead for this effort and you are coordinating with them.

Christopher

From: Csontos, Aladar  
Sent: Thursday, September 13, 2012 11:25 AM  
To: Brown, Christopher  
Subject: RE: your call

Will do. I just returned to the office from some meetings.

From: Brown, Christopher  
Sent: Thursday, September 13, 2012 11:13 AM  
To: Csontos, Aladar  
Cc: Brown, Christopher  
Subject: your call

Can you call me at home tomorrow between 9 and 10am to discuss? My cell number is (b)(6)

1  
A-19  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Friday, September 14, 2012 10:08 AM  
**To:** Kirk, Mark; Tregoning, Robert; Stevens, Gary  
**Subject:** RE: PTS NUREG

Optimism fading quickly. I'm becoming jaded, soooo jaded. I blame Gary... LOL!!!

**From:** Kirk, Mark  
**Sent:** Friday, September 14, 2012 10:08 AM  
**To:** Csontos, Aladar; Tregoning, Robert; Stevens, Gary  
**Subject:** Re: PTS NUREG

"If"???? Where is that old optimistic Al we have come to know?

Mark Kirk, (b)(6) Cell (b)(6)

---

**From:** Csontos, Aladar  
**To:** Case, Michael; Tregoning, Robert; Richards, Stuart; Stevens, Gary; Kirk, Mark  
**Sent:** Fri Sep 14 10:00:21 2012  
**Subject:** RE: PTS NUREG

Thanks Mike. We'll let you know if we receive anything.

**From:** Case, Michael  
**Sent:** Friday, September 14, 2012 7:04 AM  
**To:** Csontos, Aladar; Tregoning, Robert; Richards, Stuart; Stevens, Gary; Kirk, Mark  
**Subject:** FW: PTS NUREG

FYI

**From:** Rosenberg, Stacey  
**Sent:** Thursday, September 13, 2012 11:33 AM  
**To:** Case, Michael  
**Subject:** PTS NUREG

Hi Mike,

In response to your question this morning, EVIB staff are still reviewing the NUREG and we expect to have comments back to RES by the 2<sup>nd</sup> week in October.

We had to suspend our review for a short period while responding to the indications found at the Doel reactor in Belgium.

Let me know if you have any other questions.

Stacey

A. <sup>CS</sup>

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Friday, September 14, 2012 1:36 PM  
**To:** Kirk, Mark  
**Subject:** RE: Doel - request from FANC

That'll be very helpful... I think.

-----Original Message-----

**From:** Kirk, Mark  
**Sent:** Friday, September 14, 2012 11:44 AM  
**To:** Csontos, Aladar  
**Subject:** Re: Doel - request from FANC

Thanks much.

I have learned that the Belgian professor chairing the panel is a PRA man. So a kindred spirit perhaps.

Mark Kirk, (b)(6) Cell (b)(6)

----- Original Message -----

**From:** Csontos, Aladar  
**To:** Kirk, Mark  
**Sent:** Fri Sep 14 11:39:22 2012  
**Subject:** RE: Doel - request from FANC

Looks good.

-----Original Message-----

**From:** Kirk, Mark  
**Sent:** Thursday, September 13, 2012 7:30 PM  
**To:** Csontos, Aladar  
**Subject:** Doel - request from FANC

Al -

FANC has requested that I send a 1-page CV for myself.

Would you like to comment on the attached before I send?

Thanks

Mark



4.12  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Monday, September 17, 2012 5:36 PM  
**To:** Focht, Eric; Stevens, Gary  
**Subject:** RE: EPRI materials meeting

Yes, I have them.

Doel stuff took priority so I'll work on it tonight or tomorrow and send it out.

-----  
Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)  
-----

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**From:** Focht, Eric  
**Sent:** Monday, September 17, 2012 1:55 PM  
**To:** Stevens, Gary  
**Cc:** Csontos, Aladar  
**Subject:** RE: EPRI materials meeting

Okay. Thanks.

**From:** Stevens, Gary  
**Sent:** Monday, September 17, 2012 1:55 PM  
**To:** Focht, Eric  
**Cc:** Csontos, Aladar  
**Subject:** RE: EPRI materials meeting

No, sorry.

I believe Al did.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
(Blackberry: (b)(6) )

**From:** Focht, Eric  
**Sent:** Monday, September 17, 2012 1:48 PM  
**To:** Stevens, Gary  
**Subject:** EPRI materials meeting

Hi, Gary. Did you happen to record actions items from the meeting in Palo Alto? I was on the phone in my car and I did not write anything down. I can't remember if I had any items on HDPE.

Thanks,  
Eric

Eric Focht  
US NRC  
Office of Nuclear Regulatory Research  
Division of Engineering  
Component Integrity Branch  
Office (301) 251-7649  
Cell (b)(6)

**Cheruvengi, Ganesh**

76

**From:** Basavaraju, Chakrapani *NR*  
**Sent:** Monday, September 17, 2012 5:05 PM  
**To:** Cheruvengi, Ganesh  
**Subject:** RE: VY steam dryer cracking

Ganesh,

(b)(6)

Thanks

Pani

**From:** Sheng, Simon *NR*  
**Sent:** Monday, September 17, 2012 4:35 PM  
**To:** Cheruvengi, Ganesh; Guzman, Richard; Basavaraju, Chakrapani; Scarbrough, Thomas  
**Subject:** RE: VY steam dryer cracking

Any time Thursday is O.K. for me.

Simon

**From:** Cheruvengi, Ganesh *NR*  
**Sent:** Monday, September 17, 2012 3:59 PM  
**To:** Guzman, Richard; Sheng, Simon; Basavaraju, Chakrapani; Scarbrough, Thomas  
**Subject:** RE: VY steam dryer cracking

(b)(6)

Can we meet on Thursday instead?

**From:** Guzman, Richard *NR*  
**Sent:** Monday, September 17, 2012 2:59 PM  
**To:** Cheruvengi, Ganesh; Sheng, Simon; Basavaraju, Chakrapani; Scarbrough, Thomas  
**Subject:** RE: VY steam dryer cracking

All – please see revised draft response from VY and provide your thoughts/comments and whether it adequately addresses the RAI question(s). I'd like to target Wedn a.m. to discuss internally and then have our call w/the licensee. Please update your calendar for wedn as I plan to use the outlook scheduler to check your availabilities.

Thanks,  
Rich

**From:** Cheruvengi, Ganesh  
**Sent:** Thursday, September 13, 2012 3:11 PM  
**To:** Sheng, Simon; Basavaraju, Chakrapani; Scarbrough, Thomas; Guzman, Richard  
**Subject:** VY steam dryer cracking

All—I agree with Rich—We will wait for the final submittal and discuss the course of action.

**Trapp, James**

---

**From:** Gray, Harold  
**Sent:** Monday, September 17, 2012 9:11 AM  
**To:** Trapp, James  
**Subject:** FW: NRC Daily Notes for September 14, 2012

Jim,

FYI,

H Gray

**From:** Barkley, Richard  
**Sent:** Friday, September 14, 2012 4:54 PM  
**To:** Gray, Harold  
**Subject:** FW: NRC Daily Notes for September 14, 2012

Notice the first note below.

Richard S. Barkley, PE  
Nuclear & Environmental Engineer  
(610) 337-5328

(b)(6) (Cell)

**From:** NRC Daily Notes [<mailto:EDO.GroupAccount@nrc.gov>]  
**Sent:** Friday, September 14, 2012 4:00 PM  
**To:** EDO GroupAccount  
**Cc:** Pena, Alex  
**Subject:** NRC Daily Notes for September 14, 2012

### Daily Notes for September 14, 2012

NRR

(OUO-SII)

On September 13, the NRR and RES Office Directors approved travel of four NRC staff to Brussels, Belgium from October 13-17. The staff will participate in technical expert working groups in support of the Belgian nuclear safety authority related to indications in the Doel 3 reactor pressure vessel. Three separate meetings will be held simultaneously: nondestructive examination, fracture mechanics, and metallurgical root cause. The travelers will acquire information on Doel 3 reactor pressure vessel indications that will be applied in developing the staff's approach to the possibility of similar indications in domestic reactor vessel forgings. The Pre-Trip Report in ADAMS (ML12257A020) contains additional details.

RES

Outside of Scope

4

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Wednesday, September 19, 2012 8:07 AM  
**To:** Dunn, Darrell; Stevens, Gary  
**Subject:** RE: Doel 3 Information

Outside of Scope

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**From:** Dunn, Darrell  
**Sent:** Wednesday, September 19, 2012 6:23 AM  
**To:** Stevens, Gary; Csontos, Aladar  
**Subject:** RE: Doel 3 Information

Outside of Scope

**From:** Stevens, Gary  
**Sent:** Wednesday, September 19, 2012 6:19 AM  
**To:** Csontos, Aladar; Dunn, Darrell  
**Subject:** FW: Doel 3 Information

AI = "sick of arm" – I LIKE IT !!!!!!!

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)<<mailto:Gary.Stevens@nrc.gov>>  
Office: 301-251-7569  
Blackberry: (b)(6)

**From:** Aono Kenjiro [<mailto:aono-kenjiro@ines-usa.org>]  
**Sent:** Tuesday, September 18, 2012 4:18 PM  
**To:** Csontos, Aladar; Stevens, Gary  
**Cc:** 'Yamachika, Hidehiko'; Aono Kenjiro  
**Subject:** RE: Doel 3 Information

Csontos-san,

We hope you recover from sick of arm ASAP and play with us!

Best Regards,  
Kenjiro Aono

---

**From:** Csontos, Aladar [<mailto:Aladar.Csontos@nrc.gov>]  
**Sent:** Tuesday, September 18, 2012 3:58 PM  
**To:** Aono, Kenjiro; Stevens, Gary  
**Cc:** Yamachika, Hidehiko  
**Subject:** RE: Doel 3 Information

Good luck on the 28th. I wish I could golf. I'm sick of being in an arm sling.

From: Aono Kenjiro [<mailto:aono-kenjiro@ines-usa.org>]  
Sent: Tuesday, September 18, 2012 1:42 PM  
To: Csontos, Aladar; Stevens, Gary  
Cc: 'Yamachika, Hidehiko'; Sangimino, Donna-Marie; Tregoning, Robert; Aono Kenjiro  
Subject: RE: Doel 3 Information

Csontos-san,

I understand your suggestion.  
We will keep this information just inside of JNES and new regulatory organization.

Best Regards;  
Kenjiro Aono

---

From: Csontos, Aladar [<mailto:Aladar.Csontos@nrc.gov>]  
Sent: Tuesday, September 18, 2012 1:28 PM  
To: Aono, Kenjiro; Stevens, Gary  
Cc: Yamachika, Hidehiko; Sangimino, Donna-Marie; Tregoning, Robert  
Subject: RE: Doel 3 Information

Mr. Aono,

Please do not provide this info outside of JNES or MITA (or the new Japanese regulatory organization). We were asked not to make this public.

Thanks,  
Al

---

Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
Mailstop C5-A24M  
Washington, DC 20555-0001  
(301) 251-7640 (Office)  
(b)(6) (Blackberry)  
(301) 251-7425 (Fax)  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)

---

From: Aono Kenjiro [<mailto:aono-kenjiro@ines-usa.org>]  
Sent: Tuesday, September 18, 2012 12:23 PM  
To: Stevens, Gary  
Cc: 'Yamachika, Hidehiko'; Sangimino, Donna-Marie; Csontos, Aladar; Tregoning, Robert; Aono Kenjiro  
Subject: RE: Doel 3 Information

Gary-san,

(b)(4)

(b)(4)

From: Stevens, Gary [<mailto:Gary.Stevens@nrc.gov>]  
Sent: Tuesday, September 18, 2012 12:05 PM  
To: Aono, Kenjiro  
Cc: Yamachika, Hidehiko; Sangimino, Donna-Marie; Csontos, Aladar; Tregoning, Robert  
Subject: Doel 3 Information

Mr. Aono:

Perhaps you have already seen this information by now, but I have been authorized to release the attached 2 documents to you regarding the Doel 3 RPV in Belgium.

Best Regards,  
Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
• [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)<<mailto:Gary.Stevens@nrc.gov>>  
' 301-251-7569

=  
=



A. 27  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Wednesday, September 19, 2012 12:39 AM  
**To:** Kirk, Mark  
**Subject:** RE: Tomorrow

Fyi, I don't want the DOEL issue to be prejudged to be nothing. I'd like to allow a full airing of the issue with confirmatory calcs.

-----  
Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)  
-----

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**From:** Kirk, Mark  
**Sent:** Tuesday, September 18, 2012 9:45 PM  
**To:** Csontos, Aladar  
**Subject:** Re: Tomorrow

Thanks much boss. And understood. I'm just there to listen unless a question arises. If that happens I'll use small words.

Mark Kirk, (b)(6) Cell (b)(6)

----- Original Message -----

**From:** Csontos, Aladar  
**To:** Kirk, Mark  
**Sent:** Tue Sep 18 21:06:39 2012  
**Subject:** RE: Tomorrow

Ok. Just be careful about the level of technical detail for this group. Keep it high level. They're trying to go over all of the materials programs in 45 min!!!

-----  
Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640

Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)  
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From: Kirk, Mark  
Sent: Tuesday, September 18, 2012 8:25 PM  
To: Csontos, Aladar  
Subject: Tomorrow

Al -

I am sorry for the late notice, but I was wondering if you would be OK with me working from home tomorrow (Wed) and coming into work on Friday instead? Reason is that

(b)(6)

(b)(6)

I can participate in the EPRI meeting by phone.

Mark

Mark Kirk,

(b)(6)

Cell

(b)(6)

A. 16

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Thursday, September 20, 2012 11:23 AM  
**To:** Gavrilas, Mirela; Case, Michael; Richards, Stuart  
**Subject:** Re: impressions of the LWRS workshops

(b)(5)

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**From:** Gavrilas, Mirela  
**To:** Csontos, Aladar; Case, Michael; Richards, Stuart  
**Sent:** Thu Sep 20 11:14:03 2012  
**Subject:** RE: impressions of the LWRS workshops

Thanks for sharing, Al.

DOE prides itself on close working relationship that they have with EPRI in setting research direction for LWRS. Any thoughts why EPRI would support the directions Carol discussed below? Would the eventual success cover some glaring gaps? Would success down the road, i.e., beyond the period that NRC typically is concerned with, save the industry resources?

It is this kind of reasons that EPRI/DOE are giving for their research efforts in advanced materials, like the one Raj presented at the NRC-EPRI meeting a couple of weeks ago. The long term promise of important advances is fully consistent with DOE mission of promoting nuclear energy, and stimulating research.

M.

**From:** Csontos, Aladar  
**Sent:** Thursday, September 20, 2012 11:03 AM  
**To:** Gavrilas, Mirela; Case, Michael; Richards, Stuart  
**Subject:** Fw: impressions of the LWRS workshops

Fyi. DOE seems to want to find initiation sites which is not a part of our regulatory framework at this time or anywhere in the future.

(b)(5)

(b)(5)

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**From:** Nove, Carol  
**To:** Csontos, Aladar  
**Cc:** Anderson, Michael T <[Michael.Anderson@pnnl.gov](mailto:Michael.Anderson@pnnl.gov)>  
**Sent:** Thu Sep 20 10:53:35 2012  
**Subject:** impressions of the LWRS workshops

Al,

Per your request, here is a summary of Mike Anderson's and my impressions of the meeting at LWRS workshops back in August. Also, attached is the summary emails that were sent by the session Chairs.

Carol

The ORNL (DOE) approach appeared to be pre-determined, or at minimum, not very objective. In this regard, there were certain preconceived notions in place for long term degradation mechanisms and characterization methods. For example, core region neutron embrittlement was their number one priority for RPVs, even though they recognized that it would take much greater fluencies to degrade the RPV materials than are expected over the next license periods. We think it is more likely that there will be issues with material anomalies and/or fabrication defects that may become initiation sites for degradation that might affect integrity, such as with PTS. Yet, these are not being addressed. Further, we know from operational experience that fabrication flaws may provide initiation sites for significant degradation. These real-life issues were not on the table at this meeting. The type of issues they are proposing leads them to attempt to develop novel, untried, nontraditional NDE methods to determine the conditions of material at the lattice structure level – not what current NDE is capable of or what we actually do. As you can see from the attached, emerging NDE techniques such as non-linear acoustics were the type of high priority "NDE" methods being proposed for evaluation under ORNL's research program, but these methods are not on target for types of degradation that we expect to have to detect in the projected lifetimes of existing reactors.

Similarly, the workshop on piping was lead by ANL who are being promoted as experts in fatigue. Fatigue in piping in our operating nuclear plants has never been shown to be a problem. Although they acknowledge this, and want to include SCC in the mix, the NDE associated with fatigue may be very different than one would apply for SCC. As with the RPVs, novel, emerging NDE methods were proposed for detecting and characterizing damage/degradation at the microstructural level. Again, this is not what current NDE is capable of, nor is it addressing the issues we have at hand or on the near-horizon.

***It seems that there are some political undercurrents driving the promotion of the materials (and subsequent NDE) research for LWRS. These may cause the outcomes to be off-target, with respect to current industry needs.***

Carol A. Nove, Materials Engineer  
NRC/RES/DE/CIB  
301-251-7664  
[carol.nove@nrc.gov](mailto:carol.nove@nrc.gov)

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Poehler, Jeffrey

**From:** Kirk, Mark *RES*  
**Sent:** Friday, September 21, 2012 9:20 AM  
**To:** Hardies, Robert; Fehst, Geraldine; Csontos, Aladar; Case, Michael; Richards, Stuart  
**Cc:** Fairbanks, Carolyn; Poehler, Jeffrey; Nove, Carol; Stevens, Gary  
**Subject:** Date for Doel 3 international committee meeting

See below. Looks like it will be the week after thanksgiving.

Mark Kirk

(b)(6)

Cell

(b)(6)

----- Original Message -----

**From:** Labeau Pierre-Etienne <[pelabeau@ulb.ac.be](mailto:pelabeau@ulb.ac.be)>  
**To:** [helmut.Schulz.krtn@t-online.de](mailto:helmut.Schulz.krtn@t-online.de) <[helmut.Schulz.krtn@t-online.de](mailto:helmut.Schulz.krtn@t-online.de)>; [andre.pineau@mines-paristech.fr](mailto:andre.pineau@mines-paristech.fr) <[andre.pineau@mines-paristech.fr](mailto:andre.pineau@mines-paristech.fr)>; [timwilliams@39bhr.fsnet.co.uk](mailto:timwilliams@39bhr.fsnet.co.uk) <[timwilliams@39bhr.fsnet.co.uk](mailto:timwilliams@39bhr.fsnet.co.uk)>; [kim.wallin@vtt.fi](mailto:kim.wallin@vtt.fi) <[kim.wallin@vtt.fi](mailto:kim.wallin@vtt.fi)>; [stvims@ims.bas.bg](mailto:stvims@ims.bas.bg) <[stvims@ims.bas.bg](mailto:stvims@ims.bas.bg)>; Kirk, Mark; [benedikt.martens@sckcen.be](mailto:benedikt.martens@sckcen.be) <[benedikt.martens@sckcen.be](mailto:benedikt.martens@sckcen.be)>  
**Cc:** [willy.deroovere@fanc.fgov.be](mailto:willy.deroovere@fanc.fgov.be) <[willy.deroovere@fanc.fgov.be](mailto:willy.deroovere@fanc.fgov.be)>; [Marion.VINCK@FANC.FGOV.BE](mailto:Marion.VINCK@FANC.FGOV.BE) <[Marion.VINCK@FANC.FGOV.BE](mailto:Marion.VINCK@FANC.FGOV.BE)>  
**Sent:** Fri Sep 21 09:12:04 2012  
**Subject:** committee meeting

Dear Colleagues,

The current situation of the doodle survey shows that the week of November 25 appears as the most appropriate for our two-day committee meeting.

I'm still waiting for the availabilities of our colleague Stefan Vodenicharov. Our committee secretary Benedikt Martens will be available as well.

As soon as Stefan's availabilities will be known, I will confirm you the dates of our meeting.

Kind regards,  
Pierre-Etienne

Pierre-Etienne LABEAU

Professor

Service de Metrologie Nucleaire - Ecole polytechnique de Bruxelles Universite Libre de Bruxelles (CP165/84)

Av.F.D.Roosevelt, 50 - 1050 Bruxelles - Belgium

Tel: +32 2 6502060 (secr: 2061) - [pelabeau@ulb.ac.be](mailto:pelabeau@ulb.ac.be)

Visit the Imuhira Village: <http://www.villageimuhira.be>

A.  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Tuesday, September 25, 2012 2:46 PM  
**To:** Kirk, Mark  
**Subject:** Re: Any chance someone form your branch could do the DE technical presentation at the monthly meeting next Monday?

I think we'll go with Howard this month and then Doel next month once you guys get back from your trips and have some more info.

---

**From:** Kirk, Mark  
**To:** Csontos, Aladar  
**Sent:** Mon Sep 24 18:03:26 2012  
**Subject:** Re: Any chance someone form your branch could do the DE technical presentation at the monthly meeting next Monday?

If you want something on Doel I can put it together. Let me know.

Mark Kirk, (b)(6) Cell (b)(6) )

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**From:** Csontos, Aladar  
**To:** RES\_DE\_CIB  
**Sent:** Mon Sep 24 16:40:01 2012  
**Subject:** FW: Any chance someone form your branch could do the DE technical presentation at the monthly meeting next Monday?

Any candidates for a presentation next week?

Doel – do we know enough for a 15 minute presentation?  
Others OpE issues – Vogtle/Palisades/VC Summer?

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**From:** West, Stephanie  
**Sent:** Monday, September 24, 2012 3:40 PM  
**To:** Csontos, Aladar  
**Subject:** Any chance someone form your branch could do the DE technical presentation at the monthly meeting next Monday?

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**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Wednesday, September 26, 2012 12:50 PM  
**To:** Hardies, Robert  
**Subject:** RE: FOIA Question

Thanks. I think RES/IP and IP will cover the issue.

**From:** Hardies, Robert  
**Sent:** Wednesday, September 26, 2012 11:23 AM  
**To:** Csontos, Aladar  
**Subject:** FW: FOIA Question

This thread contains the discussion from OGC. There was more to the story, however. I understand that OIP disagrees with the interpretation described in the email below. I don't think this has been resolved. I think it won't be resolved until there is an actual FOIA. The email chain was initiated at the request of Commissioner Magwood.

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

**From:** Hiland, Patrick  
**Sent:** Friday, August 24, 2012 1:28 PM  
**To:** Merzke, Daniel  
**Cc:** Hardies, Robert  
**Subject:** FW: FOIA Question

Dan, recall the handouts we passed out during the Doel-3 Magwood briefing. Please inform those present that the information contained in the handouts could be FOIA'd.

**From:** Suttenger, Jeremy  
**Sent:** Friday, August 24, 2012 1:24 PM  
**To:** Hiland, Patrick  
**Cc:** Hirsch, Patricia  
**Subject:** RE: FOIA Question

Patrick,

I've looked into this. Unfortunately, there is not a blanket "foreign government" exception to the FOIA. So yes, this information is subject to FOIA – it does not matter that it was "government to government." But this does not necessarily mean that this information is releasable under FOIA. If, for example, the information is proprietary for one of our facilities, then we can try to protect it under Exemption 4. There are other specific exemptions (I am thinking of the privacy ones in particular) that also may apply, depending on the information.

Ultimately, whether we could protect these handouts would fairly fact-specific. If we get a "live" request, then we can take a closer look and assess our options then. Also, perhaps in the future, the best approach or your staff would be to just return the handouts at the end of the meeting, and then take personal notes to brief the folks back here at HQ (these notes can be protected under Exemption 5).

- Jeremy

**From:** Hiland, Patrick  
**Sent:** Friday, August 24, 2012 1:16 PM  
**To:** Suttenger, Jeremy  
**Subject:** RE: FOIA Question

p.s. Commissioner Magwood asked the question since we provided him with some of the handouts.

**From:** Suttenger, Jeremy  
**Sent:** Thursday, August 23, 2012 11:51 AM  
**To:** Hiland, Patrick  
**Subject:** RE: FOIA Question

Thank you. Let me research this.

**From:** Hiland, Patrick  
**Sent:** Thursday, August 23, 2012 11:49 AM  
**To:** Suttenger, Jeremy  
**Subject:** RE: FOIA Question

Jeremy, last week one of my staff visited Belgium to discuss issues in an all-regulator meeting with 7 other countries. During the course of his visit, information was provided via handouts that the Belgians indicated their desire to only release/discuss particulars within the NRC, i.e. do not make public. We used some of this information to brief Commissioner TAs and the questions arose; is this information subject to FOIA? Since it is "government to government" I was not sure of the answer. The information is related to an issue at a Belgian nuclear plant, and we attended the meeting at the invitation of the Belgian regulator.

**From:** Suttenger, Jeremy  
**Sent:** Thursday, August 23, 2012 11:37 AM  
**To:** Hiland, Patrick  
**Subject:** FOIA Question

Hello Patrick,

I hear you have a FOIA question. Please let me know what it is via e-mail.

Jeremy



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**Poehler, Jeffrey**

**From:** Kirk, Mark  
**Sent:** Wednesday, September 26, 2012 7:27 PM  
**To:** Poehler, Jeffrey  
**Subject:** Re: Metallurgy of Hydrogen Flaking Document - for Doel 3 Meeting

Many thanks Jeff. I will read this before the meeting.

... of course we are all still waiting to find out if what is really in Doel is H2 flaking at all ....

Best

Mark

Mark Kirk

(b)(6)

Cell

(b)(6)

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**From:** Poehler, Jeffrey  
**To:** Hardies, Robert; Fairbanks, Carolyn; Stevens, Gary; Nove, Carol; Kirk, Mark  
**Cc:** Rosenberg, Stacey  
**Sent:** Wed Sep 26 14:36:13 2012  
**Subject:** Metallurgy of Hydrogen Flaking Document - for Doel 3 Meeting

The attached summarizes what I have learned regarding the metallurgy of hydrogen flaking so far. It's obviously still a work in progress but I wanted to get something out in time for people to have time to skim it prior to next Wednesday's meeting.

Jeffrey C. Poehler  
Sr. Materials Engineer  
NRR/DE/EVIB  
(301) 415-8353

Lupold, Timothy

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**From:** Kulesa, Gloria *NRK*  
**Sent:** Thursday, September 27, 2012 7:21 AM  
**To:** Lupold, Timothy  
**Subject:** RE: Region I Support

I will let you know. Emmett is in Japan. He has approximately (b)(6) Therefore the timing for this and the ASN meetings present a problem. Neither form an exigent condition. (b)(6)  
(b)(6) SONGS still has its return to service review to occur and is anticipated during this time. I will need him on this activity. I may send someone else from the branch if it is needed, but realize they will most likely be reading Ken's slides. Would that be productive?

**From:** Lupold, Timothy *NRK*  
**Sent:** Thursday, September 27, 2012 7:13 AM  
**To:** Kulesa, Gloria  
**Cc:** Karwoski, Kenneth  
**Subject:** FW: Region I Support

Gloria, would it be possible to have Emmitt present to Region I regarding SG tube to tube wear? The dates has not been set yet, but we are quickly narrowing down on December 4<sup>th</sup> as the only day we can support this.

**From:** Karwoski, Kenneth *NRK*  
**Sent:** Wednesday, September 26, 2012 5:36 PM  
**To:** Lupold, Timothy; Kulesa, Gloria; Rosenberg, Stacey; Hardies, Robert  
**Subject:** RE: Region I Support

Tim,

This is a great idea. We did this in the past in the SG area with our specific counterparts, but we just haven't had the time to do it recently.

Regarding your proposed dates, unfortunately I will not be able to support (b)(6)  
(b)(6) I can, however, support preparing presentation materials.

Ken

**From:** Lupold, Timothy  
**Sent:** Tuesday, September 25, 2012 11:45 AM  
**To:** Kulesa, Gloria; Rosenberg, Stacey; Hardies, Robert; Karwoski, Kenneth  
**Subject:** Region I Support

Region I is having a Counterparts Seminar from December 4<sup>th</sup> through the 6<sup>th</sup>. At this seminar, they would like to have people from headquarters available to present on three topics: SG tube-tube wear, North Anna SG inlet hot leg examination, and the Doel 3 reactor vessel. These items affect our three branches. Tim O'Hara contacted me about the seminar, and I told him I will coordinate things from HQ end.

I would like you to consider who might be available in the Dec 4<sup>th</sup> through Dec 6<sup>th</sup> time frame that could support these presentations.

A 28

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Friday, September 28, 2012 11:56 AM  
**To:** Dion, Jeanne  
**Subject:** RE: URGENT ACTION: FW: Resent with Revised Due dates: ACTION: Operating Reactors Sequestration Exercise

(b)(5)

Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)

---

**From:** Dion, Jeanne  
**Sent:** Friday, September 28, 2012 9:54 AM

To: Csontos, Aladar  
Subject: RE: URGENT ACTION: FW: Resent with Revised Due dates: ACTION: Operating Reactors Sequestration Exercise

(b)(5)

Jeanne Dion  
Technical Assistant  
Office of Research  
U.S. Nuclear Regulatory Commission  
jeanne.dion@nrc.gov  
(Office) 301-251-7482

---

From: Csontos, Aladar  
Sent: Friday, September 28, 2012 9:28 AM  
To: Dion, Jeanne  
Subject: Re: URGENT ACTION: FW: Resent with Revised Due dates: ACTION: Operating Reactors Sequestration Exercise

(b)(5)

----- Original Message -----

From: Dion, Jeanne  
To: Csontos, Aladar  
Sent: Fri Sep 28 08:21:08 2012  
Subject: RE: URGENT ACTION: FW: Resent with Revised Due dates: ACTION: Operating Reactors Sequestration Exercise

(b)(5)

Thanks  
Jeanne Dion  
Technical Assistant  
Office of Research  
U.S. Nuclear Regulatory Commission  
jeanne.dion@nrc.gov  
(Office) 301-251-7482

---

From: Csontos, Aladar  
Sent: Thursday, September 27, 2012 5:00 PM  
To: Dion, Jeanne  
Subject: Re: URGENT ACTION: FW: Resent with Revised Due dates: ACTION: Operating Reactors Sequestration Exercise

(b)(5)

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From: Dion, Jeanne

To: Csontos, Aladar  
Sent: Thu Sep 27 16:42:39 2012  
Subject: FW: URGENT ACTION: FW: Resent with Revised Due dates: ACTION: Operating Reactors Sequestration Exercise

(b)(5)

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From: Richards, Stuart  
Sent: Thursday, September 27, 2012 4:14 PM  
To: Boyce, Tom (RES); Csontos, Aladar; Gavrilas, Mirela; Hogan, Rosemary; Sydnor, Russell  
Cc: Case, Michael; Dion, Jeanne; Hurd, Sapna; Cherry, Brandon  
Subject: URGENT ACTION: FW: Resent with Revised Due dates: ACTION: Operating Reactors Sequestration Exercise  
Importance: High

(b)(5)

(b)(5)

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From: Suri, Renu

Sent: Thursday, September 27, 2012 3:29 PM

To: Shaffer, Vered; Dion, Jeanne; Armstrong, Kenneth

Cc: Rini, Brett; Case, Michael; Richards, Stuart; Correia, Richard; Coe, Doug; Gibson, Kathy; Scott, Michael; Stout, Kathleen; Bamford, Lisa; Grancorvitz, Teresa

Subject: FW: Resent with Revised Due dates: ACTION: Operating Reactors Sequestration Exercise  
Importance: High

<<Operating Reactors Sequestration Template (Sept 26 2012).xlsx>>

(b)(5)

(b)(5)

Renu Suri

Senior Program Analyst

RES/PMDA/FPMB

(301)251-7678

renu.suri@nrc.gov

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From: Newell, Karenina

Sent: Thursday, September 27, 2012 1:49 PM

To: Newell, Karenina; Stout, Kathleen; Suri, Renu; Brezovec, Michael

Cc: Bamford, Lisa; Nguyen, Caroline; Lee, Michael; Miller, Fred; Abraham, Susan; Regan, Christopher

Subject: Resent with Revised Due dates: ACTION: Operating Reactors Sequestration Exercise

The driver for this quick turnaround action is an OD alignment meeting on Thursday, 10/4.

(b)(5)

(b)(5)

Thanks,

Karenina

Karenina Newell

U. S. Nuclear Regulatory Commission

NRR/PMDA/Budget Formulation and Execution Branch

301-415-0506 / Karenina.Newell@nrc.gov



A-29

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Thursday, October 04, 2012 9:31 AM  
**To:** Nove, Carol  
**Subject:** Re: today

Thanks see you at acrs then.

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**From:** Nove, Carol  
**To:** Csontos, Aladar  
**Sent:** Thu Oct 04 09:27:25 2012  
**Subject:** today

Just an FYI for you...

I am heading to (b)(6) in a few minutes. The office is down near EBB, so I'm just going to head over to HQ after I'm done. I'll be at the ACRS meeting this afternoon for the Doel 3 presentation. I have put both things on the branch calendar, but just wanted to let you know anyhow.

Carol

Carol A. Nove, Materials Engineer  
NRC/RES/DE/CIB  
301-251-7664  
[carol.nove@nrc.gov](mailto:carol.nove@nrc.gov)

g l m d

A. 58

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Thursday, October 04, 2012 3:35 PM  
**To:** Hackett, Edwin; Brown, Christopher; Gonzalez, Hipolito  
**Subject:** Sorry that I missed your phone call. If you still need some clarification on handling the Doel info, LMK (EOM)

---

Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
Mailstop C5-A24M  
Washington, DC 20555-0001  
(301) 251-7640 (Office)  
(b)(6) (Blackberry)  
(301) 251-7425 (Fax)  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)

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B/173

A-56

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Thursday, October 04, 2012 11:17 AM  
**To:** Kirk, Mark  
**Subject:** Re: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

Sure does. What happened to that? I'm disappointed that they didn't get the contract. I think that would have helped us in the long run too.

---

**From:** Kirk, Mark  
**To:** Csontos, Aladar  
**Sent:** Thu Oct 04 11:10:51 2012  
**Subject:** RE: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

I'm not sure why it came up.

Bob brought it up in the meeting yesterday saying he wanted me to make SURE that there was no COI with regards to ORNL, because he did not want to loose access to ORNL ... a goal I agree with.

In any event, their not having a contract rather solves the problem.

---

**From:** Csontos, Aladar  
**Sent:** Thursday, October 04, 2012 11:09 AM  
**To:** Kirk, Mark  
**Subject:** Re: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

How did this come up yesterday? This was surprising to me. We have PLENTY of precedent that this isn't an issue since NRC doesn't regulate foreign plants.

---

**From:** Kirk, Mark  
**To:** Csontos, Aladar; Hardies, Robert; Tregoning, Robert; Stevens, Gary  
**Sent:** Thu Oct 04 10:30:31 2012  
**Subject:** RE: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

It turns out that there is absolutely no COI issue whatsoever.

In a recent conversation with Richard he informed me that ORNL was not able to get a contract in place with Tractabel / Electrabel in a timeframe suitable to the Belgians. Therefore, there is no contract between ORNL and the Belgians. Therefore there is no COI.

---

**From:** Csontos, Aladar  
**Sent:** Thursday, October 04, 2012 10:29 AM  
**To:** Hardies, Robert; Tregoning, Robert; Stevens, Gary  
**Cc:** Kirk, Mark  
**Subject:** Re: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

We may want OGC to weigh in, but we did this a while ago when I was the PM for emc. They did a lot of work for Sizewell B (England) and not the British regulator on DMW piping work and they supported the NRR SE on MRP-216 "Wolf Creek" work. I have plenty of other examples.

---

**From:** Hardies, Robert  
**To:** Csontos, Aladar; Tregoning, Robert; Stevens, Gary  
**Cc:** Kirk, Mark  
**Sent:** Thu Oct 04 10:23:30 2012  
**Subject:** RE: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

Well I am glad that you have solved the COI issue. I thought it would be bigger and harder than that, but I see your point. Thanks.

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

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**From:** Csontos, Aladar  
**Sent:** Thursday, October 04, 2012 10:07 AM  
**To:** Tregoning, Robert; Stevens, Gary; Hardies, Robert  
**Subject:** Re: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

But that happens all the time. EMC and Battelle do calcs for foreign nuclear power plants for years and they do analyses for us for domestic. The COI that I could see is that he's on the independent panel and ORNL is doing calcs for Doel.

---

**From:** Tregoning, Robert  
**To:** Csontos, Aladar; Stevens, Gary; Hardies, Robert  
**Sent:** Thu Oct 04 10:02:25 2012  
**Subject:** RE: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

Al:

I agree that the Belgium's need to work out COI, but we (Gary) should just lay-out what all the potential COI issues are with them as part of that meeting on the 14<sup>th</sup> so that the rules of engagement are clear. The only COI that we need to work out (in my opinion) from the US side is the ability to use ORNL for doing calcs. related to US plants recognizing that they are doing similar calcs. for a foreign licensee.

Rob

Robert Tregoning  
Technical Advisor for Materials  
US Nuclear Regulatory Commission  
21 Church Street, M/S CS-5A24  
Rockville, MD 20850  
ph: 301-251-7662

Blackberry: (b)(6)  
fax: 301-251-7425

---

**From:** Csontos, Aladar  
**Sent:** Thursday, October 04, 2012 10:00 AM  
**To:** Stevens, Gary; Hardies, Robert; Tregoning, Robert  
**Subject:** Re: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

Correct me if I'm wrong, but isn't the COI issue a determination for Belgium to work out? We're just supporting them.

---

**From:** Stevens, Gary  
**To:** Csontos, Aladar; Hardies, Robert; Tregoning, Robert  
**Sent:** Thu Oct 04 09:44:58 2012  
**Subject:** RE: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

Actually, in talking to Rob, I am now more disposed to put together something very preliminary to state verbally during the meeting, but to respond to the WG3 Chairman and say that I can't put together what he is asking for from a collective NRC point-of-view by the 14<sup>th</sup>.....

The problem I'm having is I have way many more logistical questions than answers – especially with regards to COI stuff with ORNL and Mark's participation on that other "independent" committee.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

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**From:** Csontos, Aladar  
**Sent:** Thursday, October 04, 2012 9:39 AM  
**To:** Hardies, Robert  
**Cc:** Stevens, Gary  
**Subject:** Re: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

Ok, just seeing what our actions were. Thx!!

---

**From:** Hardies, Robert  
**To:** Csontos, Aladar  
**Cc:** Stevens, Gary  
**Sent:** Thu Oct 04 09:31:50 2012  
**Subject:** RE: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

Gary sent you an email that has the background. Belgians asked for some written stuff to stimulate conversation. They sent a questionnaire to Gary, who sent it around. I put in some potential answers and sent it back. I think he plans to collect other thoughts and put together something to send back. They want it by the 14<sup>th</sup>. I won't be in again before then.

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

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**From:** Csontos, Aladar

**Sent:** Thursday, October 04, 2012 9:01 AM

**To:** Hardies, Robert

**Subject:** Re: WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

What's the action about and what do you need from us?

---

**From:** Hardies, Robert

**To:** Stevens, Gary; Kirk, Mark; Nove, Carol; Poehler, Jeffrey

**Cc:** Csontos, Aladar; Tregoning, Robert

**Sent:** Thu Oct 04 08:04:58 2012

**Subject:** WG3 meeting 2012\_10\_16 detailed description of topics hardies first cut.docx

I've made a cut at some responses. It will be much easier for you if we do prepare a response and send it ahead of time. This may fall into the deminution of a presentation, in which case you would have to process it through AI in accordance with the foreign travel process.

**Trapp, James**

**From:** Hardies, Robert  
**Sent:** Thursday, October 04, 2012 8:34 AM  
**To:** Gray, Harold  
**Cc:** Screnci, Diane; Sheehan, Neil; Trapp, James; Burns, Thomas; Wilson, Peter; Miller, Chris  
**Subject:** RE: Newspaper opinion article RE reactor vessel cracks

Thanks for this Harold. We are going to have a public meeting after we all get back from another round of meetings with the Belgian regulator during the week of October 15. The public meeting is not set up yet, so I don't have a date.

Vermont Yankee doesn't have any Rotterdam forgings, and no forgings at all for the shell courses. They were all welded plate construction. The flanges are forgings, but the flanges have bolt holes and sealing surfaces and weld preps that were examined with surface techniques that would have picked up large numbers (or even small numbers) of linear indications. So it is safe to say that the indications found at Doel 3 cannot exist at Vermont Yankee.

(b)(5)

Robert Hardies  
Senior Level Advisor for Materials Engineering Division of Engineering Office of Nuclear Reactor Regulation U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

-----Original Message-----

**From:** Gray, Harold  
**Sent:** Thursday, October 04, 2012 7:49 AM  
**To:** Hardies, Robert  
**Cc:** Screnci, Diane; Sheehan, Neil; Trapp, James; Burns, Thomas; Wilson, Peter; Miller, Chris  
**Subject:** FW: Newspaper opinion article RE reactor vessel cracks

Bob,

In case you do not already have it, the attached.

Is NRC going to issue a summary on the significance to US plants of these UT indications, which have been characterized as hydrogen flaking, small indications in the plane of the shell surface, similar to laminations?

As I read the related info, it looks like the vacuum degassing or post forming heat treatment of the shell ring forging by the steel producer were factors in the indication development.

Harold Gray

-----Original Message-----

**From:** Rutenkroger, Scott  
**Sent:** Thursday, October 04, 2012 7:25 AM  
**To:** Gray, Harold; Burns, Thomas  
**Subject:** FW: Newspaper opinion article RE reactor vessel cracks

Either of you know anything? Or, are the current ISI and NDE inspections such that we already know it isn't possible?

Thanks,  
Scott

-----Original Message-----

From: Rutenkroger, Scott

Sent: Thursday, October 04, 2012 7:20 AM

To: Bellamy, Ronald; Setzer, Thomas; Keighley, Elizabeth; DeBoer, Joseph; Guzman, Richard

Subject: Newspaper opinion article RE reactor vessel cracks

I read this article in a local newspaper last night. I'm evaluating it for potential to be an allegation. I would think this would be an issue for which the validity is known, making it NOT an allegation. However, I don't recall any such discussion or information. Anyone know anything?

Thanks,  
Scott



**Setzer, Thomas**

---

**From:** Rutenkroger, Scott  
**Sent:** Thursday, October 04, 2012 3:49 PM  
**To:** Gray, Harold  
**Cc:** Burns, Thomas; Bellamy, Ronald; Setzer, Thomas; Keighley, Elizabeth; DeBoer, Joseph; Sheehan, Neil  
**Subject:** RE: Newspaper opinion article RE reactor vessel cracks  
**Attachments:** Letter to the Editor.pdf

Sounds good; and this information clearly establishes that the letter to the editor is not an allegation.

I do not have Neil Sheehan's recent letter to the editor on this subject. Actually, I am not aware of such.

For other's benefit, I have re-attached the letter to the editor from a member of the public that I saw that prompted me to ask the question in the first place.

Thanks,  
Scott

-----Original Message-----

**From:** Gray, Harold  
**Sent:** Thursday, October 04, 2012 2:56 PM  
**To:** Rutenkroger, Scott  
**Cc:** Burns, Thomas  
**Subject:** FW: Newspaper opinion article RE reactor vessel cracks

Scott,

FYI. If you have questions, please call one of us or Email.

Do you have Neil Sheehan's recent letter to the editor on this subject?

Harold Gray,

610-337-5325

-----Original Message-----

**From:** Hardies, Robert  
**Sent:** Thursday, October 04, 2012 8:34 AM  
**To:** Gray, Harold  
**Cc:** Screnci, Diane; Sheehan, Neil; Trapp, James; Burns, Thomas; Wilson, Peter; Miller, Chris  
**Subject:** RE: Newspaper opinion article RE reactor vessel cracks

Thanks for this Harold. We are going to have a public meeting after we all get back from another round of meetings with the Belgian regulator during the week of October 15. The public meeting is not set up yet, so I don't have a date.

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An information notice will come out after that. We have been hampered by the Belgian government not authorizing us to release information to our public.

Robert Hardies  
Senior Level Advisor for Materials Engineering Division of Engineering Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

-----Original Message-----

From: Gray, Harold  
Sent: Thursday, October 04, 2012 7:49 AM  
To: Hardies, Robert  
Cc: Screnci, Diane; Sheehan, Neil; Trapp, James; Burns, Thomas; Wilson, Peter; Miller, Chris  
Subject: FW: Newspaper opinion article RE reactor vessel cracks

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As I read the related info, it looks like the vacuum degassing or post forming heat treatment of the shell ring forging by the steel producer were factors in the indication development.

Harold Gray

-----Original Message-----

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To: Gray, Harold; Burns, Thomas  
Subject: FW: Newspaper opinion article RE reactor vessel cracks

Either of you know anything? Or, are the current ISI and NDE inspections such that we already know it isn't possible?

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Scott

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From: Rutenkroger, Scott  
Sent: Thursday, October 04, 2012 7:20 AM  
To: Bellamy, Ronald; Setzer, Thomas; Keighley, Elizabeth; DeBoer, Joseph; Guzman, Richard  
Subject: Newspaper opinion article RE reactor vessel cracks

I read this article in a local newspaper last night. I'm evaluating it for potential to be an allegation. I would think this would be an issue for which the validity is known, making it NOT an allegation. However, I don't recall any such discussion or information. Anyone know anything?

Thanks,  
Scott

29

Lupold, Timothy

**From:** Gray, Harold  
**Sent:** Thursday, October 04, 2012 9:02 AM  
**To:** Lupold, Timothy  
**Cc:** Burns, Thomas  
**Subject:** FW: Newspaper opinion article RE reactor vessel cracks

Tim,

FYI,

Harold Gray,

[10-337-5325]

-----Original Message-----

**From:** Hardies, Robert  
**Sent:** Thursday, October 04, 2012 8:34 AM  
**To:** Gray, Harold  
**Cc:** Screnci, Diane; Sheehan, Neil; Trapp, James; Burns, Thomas; Wilson, Peter; Miller, Chris  
**Subject:** RE: Newspaper opinion article RE reactor vessel cracks

Thanks for this Harold. We are going to have a public meeting after we all get back from another round of meetings with the Belgian regulator during the week of October 15. The public meeting is not set up yet, so I don't have a date.

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An information notice will come out after that. We have been hampered by the Belgian government not authorizing us to release information to our public.

Robert Hardies  
Senior Level Advisor for Materials Engineering Division of Engineering Office of Nuclear Reactor Regulation U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

-----Original Message-----

**From:** Gray, Harold  
**Sent:** Thursday, October 04, 2012 7:49 AM  
**To:** Hardies, Robert  
**Cc:** Screnci, Diane; Sheehan, Neil; Trapp, James; Burns, Thomas; Wilson, Peter; Miller, Chris  
**Subject:** FW: Newspaper opinion article RE reactor vessel cracks

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In case you do not already have it, the attached.

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As I read the related info, it looks like the vacuum degassing or post forming heat treatment of the shell ring forging by the steel producer were factors in the indication development.

Harold Gray

-----Original Message-----

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Sent: Thursday, October 04, 2012 7:25 AM  
To: Gray, Harold; Burns, Thomas  
Subject: FW: Newspaper opinion article RE reactor vessel cracks

Either of you know anything? Or, are the current ISI and NDE inspections such that we already know it isn't possible?

Thanks,  
Scott

-----Original Message-----

From: Rutenkroger, Scott  
Sent: Thursday, October 04, 2012 7:20 AM  
To: Bellamy, Ronald; Setzer, Thomas; Keighley, Elizabeth; DeBoer, Joseph; Guzman, Richard  
Subject: Newspaper opinion article RE reactor vessel cracks

I read this article in a local newspaper last night. I'm evaluating it for potential to be an allegation. I would think this would be an issue for which the validity is known, making it NOT an allegation. However, I don't recall any such discussion or information. Anyone know anything?

Thanks,  
Scott

25

Poehler, Jeffrey

**From:** Kirk, Mark  
**Sent:** Thursday, October 04, 2012 12:41 PM  
**To:** Fairbanks, Carolyn  
**Cc:** Hardies, Robert; Stevens, Gary; Poehler, Jeffrey; Nove, Carol; Csontos, Aladar  
**Subject:** Doel Q and A's

Dear Carolyn -

Thank you for providing us with a paper copy at the meeting yesterday. I am curious as to the purpose of these ... are they to go onto the website or into a press release?

I have had occasion to read them. I think they are generally very good and thorough. Also, I offer for your consideration the following comments:

1. In my opinion the answer to the question "do any plants in the US have similar inspection results" is not responsive to the question as posed. The answer says what we do now, but fails to directly answer the question posed. The answer is of course "no" and the reason is "because neither the NRC nor ASME requires it".

2. Similarly the answer to the question "were US reactor vessels inspected and tested prior to operation" is, in my opinion, not responsive to the question as posed. The answer says nothing about either inspection or testing.

3. I think that the answer to the question "in light of the Doel 3 inspection results, are US plants safe to operate" could be improved as follows:

A. I think the 1st sentence should say that the NRC is in the process of making this determination.

B. At the end of the response it says that "multiple laminar indications do not present a challenge to safe reactor vessel operation.". So that we are not seen to be presuming an outcome before all of the evidence is available I suggest removing the words "do not" and replacing them with the words "are not currently thought to".

C. In this answer it says that "the NRC intends to review modern analytical computer simulations of multiple laminar indications in forgings.". I fully agree that this is what we hope to happen, but at this stage we do not know if we will review or perform such analysis. Also, at this stage we do not know exactly what form such analysis will take. Given these unknowns I think it is better to be vague, perhaps saying instead that "the NRC intends to review and/or perform a structural safety assessment of indications of the type found in Doel on the presumption that they might exist in some US plants".

Best regards,

Mark

Mark Kirk,

(b)(6)

Cell

(b)(6)

10  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Wednesday, October 10, 2012 10:43 AM  
**To:** Case, Michael; Stevens, Gary  
**Cc:** Richards, Stuart; Dion, Jeanne; Kirk, Mark; Nove, Carol  
**Subject:** Re: Doel Update

Will do. RES setup the sharepoint site (see Gary's email below) so that we can effectively share between offices and office locations more efficiently.

---

**From:** Case, Michael  
**To:** Stevens, Gary; Csontos, Aladar  
**Cc:** Richards, Stuart; Dion, Jeanne; Kirk, Mark; Nove, Carol  
**Sent:** Wed Oct 10 10:40:08 2012  
**Subject:** RE: Doel Update

Thanks. Let's just set something up for sometime after the 1<sup>st</sup> group gets back...

**From:** Stevens, Gary  
**Sent:** Wednesday, October 10, 2012 10:39 AM  
**To:** Csontos, Aladar; Case, Michael  
**Cc:** Richards, Stuart; Dion, Jeanne; Kirk, Mark; Nove, Carol  
**Subject:** RE: Doel Update

He meantime, he can look for the latest info. at:

(b)(5)

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

**From:** Csontos, Aladar  
**Sent:** Wednesday, October 10, 2012 10:25 AM  
**To:** Case, Michael  
**Cc:** Richards, Stuart; Dion, Jeanne; Kirk, Mark; Stevens, Gary; Nove, Carol  
**Subject:** Re: Doel Update

They will be going next week. We have a telecon on the what the industry found, but NRC staff will be heading over next week.

---

**From:** Case, Michael  
**To:** Csontos, Aladar  
**Cc:** Richards, Stuart; Dion, Jeanne; Kirk, Mark; Stevens, Gary; Nove, Carol  
**Sent:** Wed Oct 10 10:19:03 2012  
**Subject:** Doel Update

Hi Al. Brian indicated a desire to get feedback from the folks who traveled over to Doei (but I was a little unsure as to who has gone and who hasn't yet.

15  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Thursday, October 11, 2012 10:02 AM  
**To:** Stevens, Gary  
**Subject:** Re: for your consideration

Ill be by this PM. Let's discuss then ok?

----- Original Message -----

**From:** Stevens, Gary  
**To:** Csontos, Aladar  
**Sent:** Thu Oct 11 09:43:34 2012  
**Subject:** FW: for your consideration

I don't understand the need for this note.

Perhaps Mark is suffering from the same this I am -- a lack of direction from Bob (or whoever) on this topic. There is a need to circle the wagons and figure out what we're doing (if anything) -- but, due to absences, that can't occur until after our adventure across the pond.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: Gary.Stevens@nrc.gov  
Office: 301-251-7569  
Blackberry: (b)(6)

-----Original Message-----

**From:** Kirk, Mark  
**Sent:** Thursday, October 11, 2012 8:44 AM  
**To:** Case, Michael; Csontos, Aladar; Stevens, Gary; Tregoning, Robert; Richards, Stuart  
**Cc:** Mark  
**Subject:** FW: for your consideration

Dear Gary, Rob, Al, Mike, and Stu (i.e., colleagues and bosses!) –

In the interest of keeping all of you in the loop I wanted you to see the e-mail below that I just sent to Bob Hardies regarding Doel. I took the decision to not "cc" you on the e-mail to Bob for several reasons. First, I did not want to set off an e-mail barrage. Second, and related to the first, I wanted Bob to be able to consider my opinion in the quiet of a personal e-mail; Bob is an old friend and colleague of mine and I believe he deserves that quiet. Finally, and more pragmatically, I did not want Bob to feel ganged up upon.

Having said all of this, I did not want any of you to be outside of the conversation ... assuming that Bob finds my arguments in any way persuasive.

I am working from home today. If anybody would like to discuss I will be in the office tomorrow.

Best,

mark



From: Kirk, Mark  
Sent: Thursday, October 11, 2012 8:38 AM  
To: Hardies, Robert  
Cc: (b)(6) Mark  
Subject: for your consideration

Dear Bob –

I hope that your sense of humor and continued home holiday are both working to heal your back. Two events of yesterday have inspired me to send you this note, to which I hope you will give due consideration. Those events were as follows:

1. Tim Hardin's suggestion at the end of the NRC/EPR! phone call concerning Doel that it would be a good idea to wait until all of the facts are in from Belgium before we commit to large actions in the United States, and
2. Reading over a small sampling of the many Electrabel/Tractebel documents that Gary and Carol received yesterday from FANC.

Some of these documents (Item 2) are complete while some are not.

(b)(4)

(b)(4)

(b)(4)

(b)(5)

(b)(5)

The Belgians have afforded us a front row seat at the show, so to speak. We will have access to all of their information before it becomes public, and through all of our work on the various review panels we will have more than ample opportunity to query the Electrabel/Tractebel engineers regarding any details of their safety case that concerns us.

(b)(5)

(b)(5)

Best regards, heal well, and safe travels,

Mark

**NRC INTERNATIONAL TRAVEL TRIP REPORT**

**Traveler, Office, Division, Phone Number:**

|                |        |                |                                                                      |
|----------------|--------|----------------|----------------------------------------------------------------------|
| Robert Hardies | NRR/DE | (301) 415-5802 | <a href="mailto:robert.hardies@nrc.gov">robert.hardies@nrc.gov</a>   |
| Jeff Poehler,  | NRR/DE | (301) 415-8353 | <a href="mailto:jeffrey.poehler@nrc.gov">jeffrey.poehler@nrc.gov</a> |
| Gary Stevens   | RES/DE | (301) 251-7569 | <a href="mailto:gary.stevens@nrc.gov">gary.stevens@nrc.gov</a>       |
| Carol Nove     | RES/DE | (301) 251-7664 | <a href="mailto:carol.nove@nrc.gov">carol.nove@nrc.gov</a>           |

**Subject:**

Travel to Brussels, Belgium to meet with the Federation Agenschap vorr Nucleaire Controle (FANC), and other international regulators to discuss reactor pressure vessel forging inspection findings on the Doel-3 and Tihange-2 plants and to meet with AIB-Vincotte International to discuss nondestructive examination of forged reactor vessels.

**Dates of Travel and Countries/Organizations Visited:**

October 13-18, 2012  
Brussels, Belgium  
Federation Agenschap vorr Nucleaire Controle (FANC)  
AIB-Vincotte International

**Desired Outcome:**

Acquire information on the results found at Doel-3 and Tihange-2 nuclear power plant reactor pressure vessel ultrasonic inspections and the on-going licensee investigations and calculations from FANC, Bel V and AIB Vincotte International. Participate in a roundtable discussion between regulatory bodies regarding relevant experiences with reactor pressure vessel inspections and flaw indications.

**Results Achieved:**

The NRC acquired information about the defects identified during ultrasonic inspection of the Doel 3 nuclear power plant, about the possible metallurgical origin of the defects, and about fracture mechanics analyses of the indications. The NRC will use the information received to address the potential for similar indications to exist in U.S. plants.

**Summary of Trip:**

The purpose of this trip was to support FANC's request for NRC participation<sup>1</sup> on three technical expert working groups in support of Belgian nuclear safety authority's assessment of the indications recently detected in the beltline shell region of the Doel Unit 3 reactor pressure vessel (RPV). Similar indications were also found at Tihange Unit 2. The objectives of these working group meetings were:

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<sup>1</sup> Relevant ADAMS Accession Nos.: FANC Request for NRC support (ML1224A335), NRR request for RES assistance (ML1224A258), and RES response to NRR request for assistance (ML1224A108).

- Share information and experience between nuclear safety authorities on regulatory approaches and actions in relation with the Doel 3 issue.
- Taking into account the lessons learned from the Doel 3 issue, discuss actions to be considered in other countries.
- Provide technical advice to Belgian nuclear safety authorities (FANC, Bel V, AIB Vincotte) on specific topics / questions related to the Doel 3 & Tihange 2 RPV issue. However, the actual evaluation of potential continued operation of the Doel 3 and Tihange 2 reactors remains the responsibility of the Belgian nuclear safety authorities.

The meeting consisted of three expert working groups composed of expert members proposed by foreign nuclear safety authorities or related organizations (NRC, IAEA, NEA, JRC Petten, etc.) that were willing to participate in this issue. The three expert working groups were as follows:

- Expert Working Group 1 - Non-destructive Examination Techniques, NRC Participant = Carol Nove (RES/DE/CIB)
- Expert Working Group 2 - Metallurgical Origin / Root Causes of the Flaw Indications, NRC Participant = Jeff Poehler (NRR/DE/EVIB)
- Expert Working Group 3 - Structural Mechanics and Fracture Mechanics – Approach for Justification, NRC Participant = Gary Stevens (RES/DE/CIB)

In addition, Bob Hardies (NRR/DE) acted as an NRC Liaison to all three working groups.

The chairman and technical secretary for each working group were provided by Belgian nuclear safety authorities.

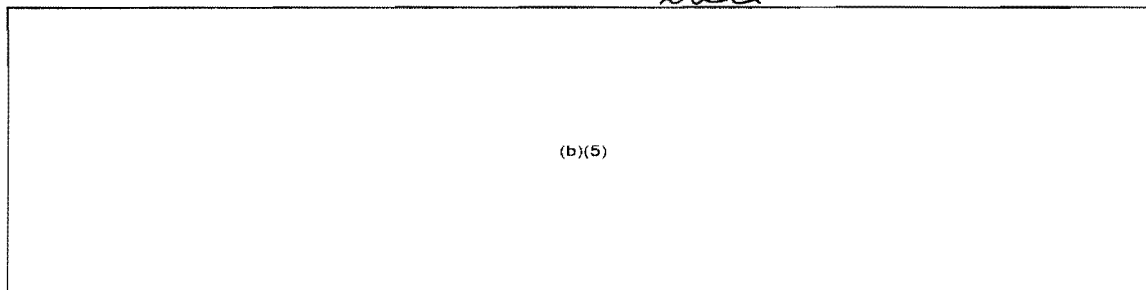
On October 17, 2012, NRC staff met with personnel from AIB-Vincotte International for detailed discussions of the nondestructive examination evolutions at Doel and Tihange.

**Additional Information/Discussion:**

Summaries of the individual working group meetings are attached. This meeting was the second in a series of meetings with FANC. The trip report for the initial meeting is available at ADAMS number ML12236A307.

**Pending Actions/Planned Next Steps for NRC:**

The NRC is establishing a plan to address the findings. Proposed activities include:



**Points for Commission Consideration/Interest:**

|        |        |
|--------|--------|
| (b)(4) |        |
| (b)(4) | (b)(5) |
| (b)(5) |        |

(b)(4)

(b)(4)

(b)(4)

(b)(4)



20  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Thursday, October 18, 2012 11:01 AM  
**To:** Stevens, Gary; Iyengar, Raj; Nove, Carol  
**Subject:** RE: Please check the POW item

Yes, we should include that too.

**From:** Stevens, Gary  
**Sent:** Thursday, October 18, 2012 10:30 AM  
**To:** Iyengar, Raj; Nove, Carol  
**Cc:** Csontos, Aladar  
**Subject:** RE: Please check the POW item

Corrected below.

I am assuming the 10/25 a.m. briefing with Brian will also be included on this list?

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

**From:** Iyengar, Raj  
**Sent:** Thursday, October 18, 2012 10:17 AM  
**To:** Stevens, Gary; Nove, Carol  
**Cc:** Csontos, Aladar  
**Subject:** Please check the POW item

Please revise the following item, if needed. If this should not go in next week's POW, please let me know.

Raj

(b)(6)

M-10

## NRC INTERNATIONAL TRAVEL TRIP REPORT

**Date:** October 22, 2012  
**Traveler:** Gary L. Stevens  
**Office:** RES  
**Division:** DE  
**Branch:** CIB  
**Phone Number:** 301-251-7569  
**E-mail:** [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)

**Subject:** FANC Meeting in Brussels, BELGIUM Regarding the Indications Found in the Doel Unit 3 Reactor Pressure Vessel

**Dates of Travel:** October 14, 2012 – October 17, 2012 (Meeting date = October 16, 2012)

**Countries/Organizations Visited:** BELGIUM/ Federal Agency for Nuclear Control (FANC)

**Subjects Discussed:** The purpose of this trip was to support FANC's request for NRC participation<sup>1</sup> on three technical expert working groups in support of Belgian nuclear safety authority's assessment of the indications recently detected in the beltline shell region of the Doel Unit 3 reactor pressure vessel (RPV). Similar indications were also found at Tihange Unit 2. This objectives of these working group meetings were:

- Share information and experience between nuclear safety authorities on regulatory approaches and actions in relation with the Doel 3 issue.
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- Provide technical advice to Belgian nuclear safety authorities (FANC, Bel V, AIB Vinçotte) on specific topics / questions related to the Doel 3 & Tihange 2 RPV issue. However, the actual evaluation of potential continued operation of the Doel 3 and Tihange 2 reactors remains the responsibility of the Belgian nuclear safety authorities.

The meeting consisted of three expert working groups composed of expert members proposed by foreign nuclear safety authorities or related organizations (NRC, IAEA, NEA, JRC Petten, etc.) that were willing to participate in this issue. The three expert working groups were as follows:

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<sup>1</sup> Relevant ADAMS Accession Nos.: FANC Request for NRC support (ML1224A335), NRR request for RES assistance (ML1224A258), and RES response to NRR request for assistance (ML1224A108).

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- Expert Working Group 3 - Structural Mechanics and Fracture Mechanics – Approach for Justification, NRC Participant = Gary Stevens (RES/DE/CIB)

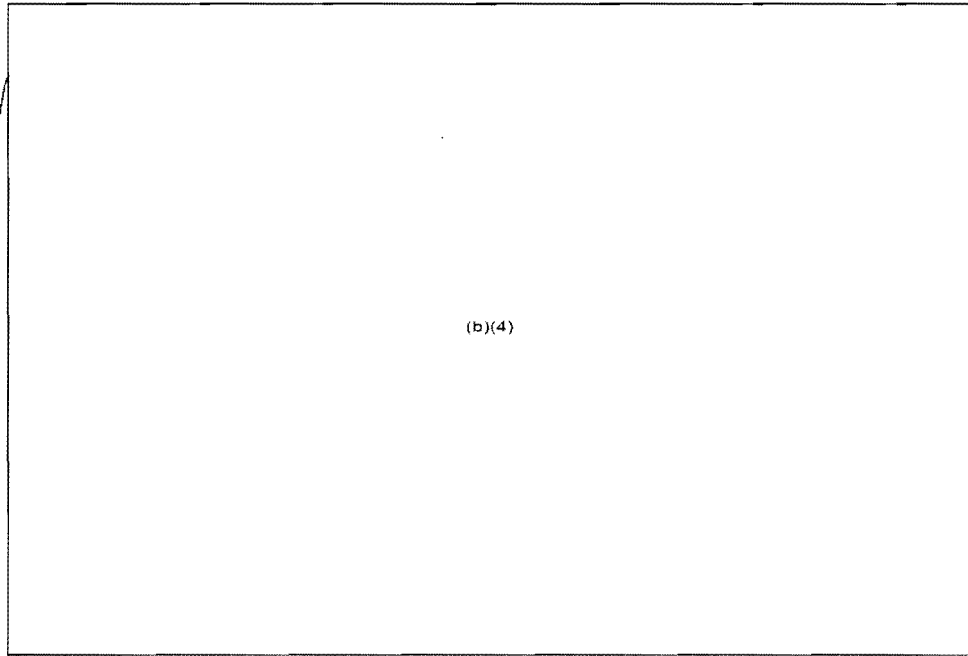
In addition, Bob Hardies (NRR/DE) acted as an NRC Liaison to all three working groups.

The chairman and technical secretary for each working group were provided by Belgian nuclear safety authorities.

This portion of this trip report summarizes the Working Group 3 (WG3) portion of the meetings, in which Gary Stevens was the NRC participant.

(b)(4)

Exemptis  
# 4



Exemption  
#4

(b)(4)

**Desired Outcome:** FANC's desired outcome for the WG3 meeting was to provide support to the Belgian nuclear safety authorities for defining essential questions that the Belgian licensee must address to satisfy safe continued operation of the Doel 3 plant.

For the NRC, the desired outcome of attendance at the WG3 meeting was to obtain information such that the NRC can determine the importance of the flaws detected at Doel 3 and Tihange 2 that can be used to assess the importance of this issue on the U.S. fleet of reactors.

**Results Achieved:** The following results were achieved from NRC attendance at the WG3 meeting:

- NRC gained the perspective on how the Belgian nuclear regulator is managing the Doel 3 issue for their plants.
- The NRC gained details of the Doel 3 issue, including technical assessments performed to assess adequacy of the indications detected in the Doel 3 RPV. The reports summarizing these technical assessments are available, but are not included in this trip report (b)(5)

(b)(5)

- The NRC gained insight on what actions other countries have taken, or are considering, in response to the Doel 3 findings and the results of those actions. (b)(4)

(b)(4)

- The NRC became familiar and gained a working relationship with other international members of WG3.

**Summary of Trip:** Gary Stevens (RES/DE/CIB) visited the FANC Office in Downtown Brussels on Tuesday, October 16<sup>th</sup>, 2012 to attend the WG3 meeting.

WG3 participants and attendees are shown in **Attachment 1**.

The meeting agenda is included as **Attachment 2**.

The WG3 Chairman, Guy Roussel (BEL V), began the meeting by defining the meeting objectives (see **Attachment 3**), followed by introductory remarks (see **Attachment 4**).

The introductory remarks were followed by two presentations on national regulatory views on structural integrity:

- Sweden: Björn Brickstad (see **Attachment 5**)
- UK : John Highton (see **Attachment 6**)

The remainder of the morning session of the meeting was devoted to presentations on views provided prior to the meeting by several WG3 members on topics identified prior to the meeting by the Chairman. The topics are identified in **Attachment 12**. The following presentations were made:

- C. Anta Redondo (Spain, see **Attachment 7**)
- S. Crombez (France, see **Attachment 8**)
- K. Hasegawa (Japan, see **Attachment 9**)
- L. Lindhorst (Netherlands, see **Attachment 10**)
- I. Simonovski (European commission, see **Attachment 11**)

After lunch, the meeting was concluded with an open discussion of the topics provided by the Chairman ahead of the meeting (see **Attachment 12**).

**Additional Information:** None.

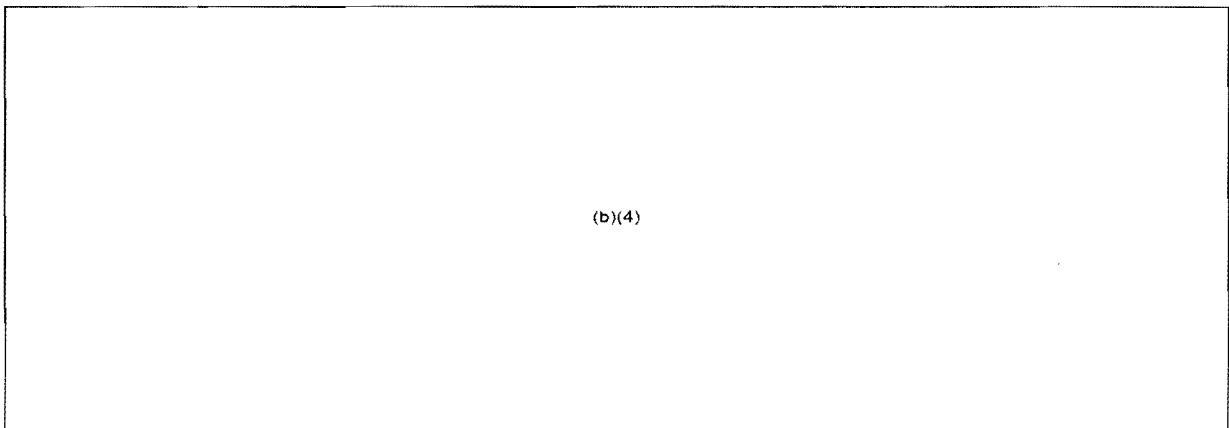
**Pending Actions/Planned Next Steps for NRC:** FANC has requested that the NRC support another meeting of WG3 in late November or early December. RES and NRR will discuss this request subsequent to debrief meetings with NRR and RES management.

The following summarizes the key actions from this meeting:

- NRC (Gary Stevens) to provide recent ASME Section XI Interpretation/Code Action on flaw proximity rules to WG3 Chairman
  - STATUS: COMPLETE (10/18/2012).
- NRC to attend another meeting of WG3 in late November or early December
  - STATUS: TBD.

**Points for Commission Consideration/Interest:** None.

**Attachments:** The following attachments are included with this trip report:



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**NRC INTERNATIONAL TRAVEL TRIP REPORT**

**Date:** October 22, 2012  
**Traveler:** Carol A. Nove  
**Office:** RES  
**Division:** DE  
**Branch:** CIB  
**Phone Number:** 301-251-7664  
**E-mail:** carol.nove@nrc.gov

**Subject:** Meetings in Brussels, BELGIUM Regarding the Indications Found in the Doel Unit 3 Reactor Pressure Vessel

**Dates of Travel:** October 14, 2012 – October 18, 2012 (Meeting dates = October 16, 2012 with FANC and October 17, 2012 with Vincotte)

**Countries/Organizations Visited:** BELGIUM/ Federal Agency for Nuclear Control (FANC) and AIB-Vincotte International (Vincotte)

**Subjects Discussed:** The purpose of this trip was to support FANC's request for NRC participation<sup>1</sup> on three technical expert working groups in support of Belgian nuclear safety authority's assessment of the indications recently detected in the beltline shell region of the Doel Unit 3 reactor pressure vessel (RPV). Similar indications were also found at Tihange Unit 2. This objectives of these working group meetings were:

- Share information and experience between nuclear safety authorities on regulatory approaches and actions in relation with the Doel 3 issue.
- Taking into account the lessons learned from the Doel 3 issue, discuss actions to be considered in other countries.
- Provide technical advice to Belgian nuclear safety authorities (FANC, Bel V, AIB Vincotte) on specific topics / questions related to the Doel 3 & Tihange 2 RPV issue. However, the actual evaluation of potential continued operation of the Doel 3 and Tihange 2 reactors remains the responsibility of the Belgian nuclear safety authorities.

The meeting consisted of three expert working groups composed of expert members proposed by foreign nuclear safety authorities or related organizations (NRC, IAEA, NEA, JRC Petten, etc.) that were willing to participate in this issue. The three expert working groups were as follows:

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<sup>1</sup> Relevant ADAMS Accession Nos.: FANC Request for NRC support (ML1224A335), NRR request for RES assistance (ML1224A258), and RES response to NRR request for assistance (ML1224A108).

- Expert Working Group 1 - Non-destructive Examination Techniques, NRC Participant = Carol Nove (RES/DE/CIB)
- Expert Working Group 2 - Metallurgical Origin / Root Causes of the Flaw Indications, NRC Participant = Jeff Poehler (NRR/DE/EVIB)
- Expert Working Group 3 - Structural Mechanics and Fracture Mechanics – Approach for Justification, NRC Participant = Gary Stevens (RES/DE/CIB)

In addition, Bob Hardies (NRR/DE) acted as an NRC Liaison to all three working groups.

The chairman and technical secretary for each working group were provided by Belgian nuclear safety authorities.

This portion of this trip report summarizes the Working Group 1 (WG1) portion of the meetings, in which Carol Nove was the NRC participant.

Following introductions of the WG1 participants, the meeting opened with Vincotte NDT experts providing an overview of the three major exams that have been completed since June:

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Following these presentations, the Working Group had the opportunity to discuss the documents that had been made available by the licensee prior to the Working Group meeting. Comments and questions related to the content of each document were generated for presentation to the licensee.

The final portion of the WG1 meeting was a question and answer session with several representatives from the licensee.

This portion of this trip report summarizes the meeting between Carol Nove and Robert Hardies of NRC and Hans Vandriessche and Daniel Rozanski of AIB

Vincotte International, the inspection and certification organization for FANC. Mr. Vandriessche and Mr. Rozanski are both NDT experts (UT Level III) who have been thoroughly involved in the Doel 3 and Tihange 2 examinations.

This was an informal meeting during which the NRC staff had the opportunity to have detailed discussions regarding the UT examinations performed at Doel 3 and Tihange 2. The staff gained a more thorough understanding of the ultrasound examination techniques and results including how UT interacts with hydrogen flakes, as well as the recording and acceptance criteria used for the various UT exams performed. The staff re-iterated their request for detailed position and size information on all of the indications found in the Doel 3 vessel.

**Desired Outcome:** FANC's desired outcome for the WG1 meeting was to provide support to the Belgian nuclear safety authorities for defining essential questions that the Belgian licensee must address to satisfy safe continued operation of the Doel 3 plant.

For the NRC, the desired outcome of attendance at the WG1 meeting was to obtain information such that the NRC can assess: (1) the ultrasonic examinations of the Doel 3 vessel (b)(4) (what exactly was done, to what criteria was the UT technique qualified, how data was interpreted, how were indications counted, etc.); (2) whether the original ultrasonic examinations detected these anomalies, and if so, why were they not reported; (3) additional measures that may be required to fully understand the UT findings.

**Results Achieved:** The following results were achieved from NRC attendance at the WG3 meeting:

- NRC gained the perspective on how the Belgian nuclear regulator is managing the Doel 3 issue for their plants.
- The NRC gained details of the Doel 3 issue, including technical assessments performed to assess adequacy of the indications detected in the Doel 3 RPV. The reports summarizing these technical assessments are available, but are not included in this trip report. (b)(5)

(b)(5)

- The NRC gained insight on what actions other countries have taken, or are considering, in response to the Doel 3 findings and the results of those actions. (b)(4)

(b)(4)

(b)(4)

- The NRC became familiar and gained a working relationship with other international members of WG3.

**Summary of Trip:** Gary Stevens (RES/DE/CIB) visited the FANC Office in Downtown Brussels on Tuesday, October 16<sup>th</sup>, 2012 to attend the WG3 meeting.

(b)(4)

**Additional Information:** None.

**Pending Actions/Planned Next Steps for NRC:** FANC has requested that the NRC support another meeting of WG3 in late November or early December. RES and NRR

will discuss this request subsequent to debrief meetings with NRR and RES management.

The following summarizes the key actions from this meeting:

- NRC (Gary Stevens) to provide recent ASME Section XI Interpretation/Code Action on flaw proximity rules to WG3 Chairman
  - STATUS: COMPLETE (10/18/2012).
- NRC to attend another meeting of WG3 in late November or early December
  - STATUS: TBD.

**Points for Commission Consideration/Interest:** None.

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21  
A  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 2:30 PM  
**To:** Stevens, Gary  
**Subject:** Re: Q2-Q4 FY13 International Travel due Oct 26

Ok. Thanks.

Btw, for Environmental Fatigue - we don't have concerns until the 1st Second LRP?

---

**From:** Stevens, Gary  
**To:** Csontos, Aladar  
**Sent:** Tue Oct 23 14:26:07 2012  
**Subject:** RE: Q2-Q4 FY13 International Travel due Oct 26

This is not an issue with ranking -- never has been, never will be.

Rather, it is the lack of definition associated with #1 = BELGIUM. Without that, #1 is useless.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 1:51 PM  
**To:** Stevens, Gary  
**Subject:** RE: Q2-Q4 FY13 International Travel due Oct 26

You're a GG-15 and my most senior staff member. Are you saying that you can't prioritize this effort? If you're feeling pulled by Bob or FANC, then let me know and I'll take care of it, like the written answers to the FANC questions before you left.

Here's your Priorities:

1. Emergent safety work
2. Regional support
3. ASME Support
4. UNR work:
  1. RPV
  2. EAF
  3. xLPR

---

Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)

---

**From:** Stevens, Gary  
**Sent:** Tuesday, October 23, 2012 1:43 PM  
**To:** Csontos, Aladar  
**Subject:** RE: Q2-Q4 FY13 International Travel due Oct 26

On doel, I just wish somebody would authorize me to work this effort – either all-in or all-out – the in-between-never-make-a-decision half-pregnant stuff is frustrating the crap out of me – especially given the impact it is having on my other work.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 1:38 PM  
**To:** Stevens, Gary  
**Subject:** RE: Q2-Q4 FY13 International Travel due Oct 26

(b)(5)

Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)

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**From:** Stevens, Gary  
**Sent:** Tuesday, October 23, 2012 6:59 AM  
**To:** Csontos, Aladar  
**Subject:** RE: Q2-Q4 FY13 International Travel due Oct 26

No trips planned, including Belgium. Let me know if that needs to change.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)

Office: 301-251-7569

Blackberry: (b)(6)

**From:** Csontos, Aladar  
**Sent:** Monday, October 22, 2012 6:31 PM  
**To:** RES\_DE\_CIB  
**Subject:** Fw: Q2-Q4 FY13 International Travel due Oct 26  
**Importance:** High

Fyi

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**From:** Roche, Robert  
**To:** Gavrilas, Mirela; Csontos, Aladar; Sydnor, Russell; Boyce, Tom (RES); Hogan, Rosemary; Tregoning, Robert; Murphy, Andrew; Ali, Syed; Birla, Sushil  
**Cc:** Case, Michael; Richards, Stuart; Dion, Jeanne  
**Sent:** Mon Oct 22 18:01:13 2012  
**Subject:** FW: Q2-Q4 FY13 International Travel due Oct 26

All,

This is a friendly reminder regarding the call for international travel (please see the e-mail below). The due date for entering your trips in the SharePoint site is October 26, 2012.

<http://itravel.nrc.gov/SitePages/Home.aspx>

Regards,

Robert G. Roche-Rivera  
U.S. Nuclear Regulatory Commission  
RES/DE/SGSEB  
Office:C-OSC13  
Mail Stop: C-05C07M  
(301) 251 - 7645  
[Robert.Roche@nrc.gov](mailto:Robert.Roche@nrc.gov)

**From:** Dion, Jeanne  
**Sent:** Wednesday, September 26, 2012 1:04 PM  
**To:** Gavrilas, Mirela; Csontos, Aladar; Sydnor, Russell; Boyce, Tom (RES); Hogan, Rosemary; Tregoning, Robert; Murphy, Andrew; Ali, Syed; Birla, Sushil  
**Cc:** Case, Michael; Richards, Stuart  
**Subject:** Q2-Q4 FY13 International Travel due Oct 26  
**Importance:** High

All,

The call for international travel is due to the FO by Nov 1<sup>st</sup> - which means you need to enter your trips in the SharePoint site **by October 26<sup>th</sup>**. Please remind your staff that they need branch chief approval before submitting a trip request.

<http://itravel.nrc.gov/SitePages/Home.aspx>

**Keep in mind...**

- Agency guidance is to reduce spending in this area, and the Front Office/PMDA will work with divisions to achieve this. Trips with multiple travelers, for example, will get especially close scrutiny. Please be sure to clearly state each traveler's unique role in a trip.

- Do not commit to chairing/participating in a meeting without prior Front Office approval, which this review process achieves. Please word these cases as a request for approval ("if approved, traveler will chair..." or "traveler has been invited to chair...").
- Estimated Costs should be uniform – use the cost calculator spreadsheet at:  
<http://portal.nrc.gov/edo/res/pmda/International/PublicLibrary/TripCostEstimator.xlsx>
- Contractors' travel should be entered as \$0 since contract funds are used, not travel funds. The "office" field should be set to RES, but other details on contractor travel in the comments field. Justifications are still important for contractors and face the same level of scrutiny as RES travelers.
- Conference registration fees should be included in the cost of trips – it comes from the travel budget instead of the training budget.
- Before entering a trip, consider composing the text in a separate document, and cut/paste into SharePoint to prevent losing data on internet explorer.
- A single trip should include all NRC travelers (even those in other offices) instead of individual travelers. Coordinate now with staff in all offices that may be taking the same trip. As a group, identify a primary trip POC.
- Include all travel days in trip duration.
- Travelers can enter their own travel. However, division Administrative Assistants and/or TA's and subsequently Division Directors will still need to review their respective trips prior to Front Office review.
- Travelers should be aware that even if trips are approved that changes can occur based on future agency guidance.
- On eTravel, when creating a new trip, be sure to use the international "purpose code" to categorize any international trip regardless of its purpose (i.e. other purposes may apply, but select international).

Feel free to be in touch with any of us with questions: Wendy Eisenberg, 301-251-7682, Donna-Marie Sangimino, 301-251-7673.

Thanks,

Jeanne Dion  
 Technical Assistant  
 U.S. Nuclear Regulatory Commission  
 Office of Nuclear Regulatory Research  
 Division of Engineering  
[jeanne.dion@nrc.gov](mailto:jeanne.dion@nrc.gov)  
 301-251-7482

10/14  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 2:36 PM  
**To:** Hardies, Robert; Stevens, Gary; Poehler, Jeffrey; Nove, Carol  
**Cc:** Fairbanks, Carolyn; Kirk, Mark  
**Subject:** RE: Friendly Reminder: Trip Report Due

Great, thanks!!!

-----  
Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)  
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**From:** Hardies, Robert  
**Sent:** Tuesday, October 23, 2012 2:32 PM  
**To:** Csontos, Aladar; Stevens, Gary; Poehler, Jeffrey; Nove, Carol  
**Cc:** Fairbanks, Carolyn; Kirk, Mark  
**Subject:** RE: Friendly Reminder: Trip Report Due

Jeff is doing part, Carol is doing part, and Gary is doing part. I am putting them together and putting out the report. It is due next Thursday. I will have it done by Monday.

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

(Cell (b)(6) )

**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 2:09 PM  
**To:** Hardies, Robert; Stevens, Gary; Poehler, Jeffrey; Nove, Carol  
**Cc:** Fairbanks, Carolyn; Kirk, Mark  
**Subject:** RE: Friendly Reminder: Trip Report Due

Thanks. Who's the lead?

-----  
Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research



U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)

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**From:** Hardies, Robert  
**Sent:** Tuesday, October 23, 2012 2:07 PM  
**To:** Csontos, Aladar; Stevens, Gary; Poehler, Jeffrey; Nove, Carol  
**Cc:** Fairbanks, Carolyn; Kirk, Mark  
**Subject:** RE: Friendly Reminder: Trip Report Due

Yes

Robert Hardies  
Senior Level Advisor for Materials Engineering  
Division of Engineering  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

Office Phone 301 415-5802

Cell (b)(6)

**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 1:39 PM  
**To:** Stevens, Gary; Poehler, Jeffrey; Hardies, Robert; Nove, Carol  
**Cc:** Fairbanks, Carolyn; Kirk, Mark  
**Subject:** RE: Friendly Reminder: Trip Report Due

Are you all going to submit one trip report for all?

---

Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)

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**From:** Stevens, Gary  
**Sent:** Friday, October 19, 2012 12:09 PM  
**To:** Poehler, Jeffrey; Hardies, Robert; Nove, Carol  
**Cc:** Fairbanks, Carolyn; Kirk, Mark; Csontos, Aladar  
**Subject:** RE: Friendly Reminder: Trip Report Due

My trip report is attached for your review and comment. I will add all of the attachments later, but if you want to see them in the meantime, they have been uploaded to the Doel 3 Sharepoint site under the WG3 directory.

I will look forward to discussing how we finalize the trip report(s?) during our Monday afternoon debrief.

Bob/Carol: I hope you had an uneventful trip back to the U.S.

Everyone have a good weekend.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

**From:** Poehler, Jeffrey  
**Sent:** Thursday, October 18, 2012 12:10 PM  
**To:** Hardies, Robert; Nove, Carol; Stevens, Gary  
**Subject:** RE: Friendly Reminder: Trip Report Due

I'm going to work on the inputs for the Metallurgy working group. I suggest we do one combined report. I can send the template with my input to you guys when I am done. I'll take a shot at the general information as well.

Jeff

**From:** NRR International Activities [<mailto:SVCportaladmin@nrc.gov>]  
**Sent:** Friday, October 12, 2012 5:31 AM  
**To:** Hardies, Robert; Poehler, Jeffrey; Nove, Carol; Stevens, Gary  
**Subject:** Friendly Reminder: Trip Report Due

This is an auto notification to remind you that the due date for submitting your trip report is in 1 week. The trip report template can be found in the NRR International Activities SharePoint under [Travel Documents and Info](#). Please note that the trip report should be added to ADAMS. The **ADAMS P8 link to the document** and its **ML number** should be sent to [NRRInternationalTravel.Resource@nrc.gov](mailto:NRRInternationalTravel.Resource@nrc.gov).

Further details about your trip and its associated due dates are available in the [NRR International Travel Call system](#).

If you have questions or need assistance please contact us.  
The NRR International Activities Team

N-4  
Nove, Carol

**From:** Anderson, Michael T [Michael.Anderson@pnnt.gov]  
**Sent:** Tuesday, October 23, 2012 3:07 PM  
**To:** Nove, Carol  
**Subject:** RE: need help with IRSN terminology

(b)(5)

**From:** Nove, Carol [mailto:Carol.Nove@nrc.gov]  
**Sent:** Tuesday, October 23, 2012 11:49 AM  
**To:** Anderson, Michael T  
**Subject:** need help with IRSN terminology

Hi Mike,

I am reading over some stuff from IRSN related to modeling they did for Doel and they say the following:

(b)(4)

I just want to make sure I understand their terminology...can you help with what I've sent above or do I need to put it into better context (like sending you the slide)?

Thanks,  
Carol

Carol A. Nove, Materials Engineer  
NRC/RES/DE/CIB  
301-251-7664  
[carol.nove@nrc.gov](mailto:carol.nove@nrc.gov)

10-23-53  
**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 11:53 AM  
**To:** Kirk, Mark; Stevens, Gary; Nove, Carol  
**Subject:** Re: Slides for Brian on Thursday

Additional staff to augment you. Willing to provide benson or others.

---

**From:** Kirk, Mark  
**To:** Csontos, Aladar; Stevens, Gary; Nove, Carol  
**Sent:** Tue Oct 23 11:32:18 2012  
**Subject:** RE: Slides for Brian on Thursday

I believe that the point is that Doel could (conceivably) consume much time on all of our parts. Management needs to be aware of this ... because (as Gary said) it will have impact on other things.

What do you mean "support to help out"?

---

**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 11:31 AM  
**To:** Stevens, Gary; Nove, Carol  
**Cc:** Kirk, Mark  
**Subject:** Re: Slides for Brian on Thursday

Thanks. Are other work high priority as emergent support for NRR? Do you need support to help out?

---

**From:** Stevens, Gary  
**To:** Csontos, Aladar; Nove, Carol  
**Cc:** Kirk, Mark  
**Sent:** Tue Oct 23 11:25:51 2012  
**Subject:** RE: Slides for Brian on Thursday

Answers below.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

---

**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 11:17 AM  
**To:** Stevens, Gary; Nove, Carol  
**Cc:** Kirk, Mark  
**Subject:** Slides for Brian on Thursday

Mike, Stu, and I are not up to speed on what transpired with your trip to Doel. We need an update first before the Brian brief on Thursday. I'd prefer a conversation today or tomorrow. I'll call in. I WILL SET UP A MEETING FOR TOMORROW.

Also, when can I expect the slides for Brian's brief. TOMORROW NOON-ISH.

Are we including Bob to this meeting, NO.  
if not, should we? I ASKED HIM – HE'S BUSY AND SAID DON'T BOTHER AS HE CAN'T MAKE IT ANYWAY.

**Also on the docket for tomorrow's and Thursday's meetings:** I will be requesting management direction on this issue. I have been asked for significant support from the Belgians. Such support has not been authorized or supported yet, and it will significantly impact other on-going work.

---

Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640

Fax: (301) 251-7425

Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)

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A-39

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 1:47 PM  
**To:** Kirk, Mark  
**Subject:** RE: question on your edits

no, then delete the article from the reference. Its not relevant to the trip report and the translation may be off and cause lots of issues.

---

Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)

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**From:** Kirk, Mark  
**Sent:** Tuesday, October 23, 2012 1:44 PM  
**To:** Csontos, Aladar  
**Subject:** question on your edits

AI -

You removed the reference to the Donga Science article, but the article is still on the list of attachments.

Do you not want me to mention the article?

Please advise.

Thanks

mark

---

**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 1:39 PM  
**To:** Stevens, Gary; Poehler, Jeffrey; Hardies, Robert; Nove, Carol  
**Cc:** Fairbanks, Carolyn; Kirk, Mark  
**Subject:** RE: Friendly Reminder: Trip Report Due

Are you all going to submit one trip report for all?

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Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission

6/10/12

21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)

---

**From:** Stevens, Gary  
**Sent:** Friday, October 19, 2012 12:09 PM  
**To:** Poehler, Jeffrey; Hardies, Robert; Nove, Carol  
**Cc:** Fairbanks, Carolyn; Kirk, Mark; Csontos, Aladar  
**Subject:** RE: Friendly Reminder: Trip Report Due

My trip report is attached for your review and comment. I will add all of the attachments later, but if you want to see them in the meantime, they have been uploaded to the Doel 3 Sharepoint site under the WG3 directory.

I will look forward to discussing how we finalize the trip report(s?) during our Monday afternoon debrief.

Bob/Carol: I hope you had an uneventful trip back to the U.S.

Everyone have a good weekend.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

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**From:** Poehler, Jeffrey  
**Sent:** Thursday, October 18, 2012 12:10 PM  
**To:** Hardies, Robert; Nove, Carol; Stevens, Gary  
**Subject:** RE: Friendly Reminder: Trip Report Due

I'm going to work on the inputs for the Metallurgy working group. I suggest we do one combined report. I can send the template with my input to you guys when I am done. I'll take a shot at the general information as well.

Jeff

---

**From:** NRR International Activities [<mailto:SVCportaladmin@nrc.gov>]  
**Sent:** Friday, October 12, 2012 5:31 AM  
**To:** Hardies, Robert; Poehler, Jeffrey; Nove, Carol; Stevens, Gary  
**Subject:** Friendly Reminder: Trip Report Due

This is an auto notification to remind you that the due date for submitting your trip report is in 1 week. The trip report template can be found in the NRR International Activities SharePoint under [Travel Documents and Info](#). Please note that the trip report should be added to ADAMS. The **ADAMS P8 link to the document** and its **ML number** should be sent to [NRRInternationalTravel.Resource@nrc.gov](mailto:NRRInternationalTravel.Resource@nrc.gov).

Further details about your trip and its associated due dates are available in the [NRR International Travel Call system](#).

If you have questions or need assistance please contact us.  
The NRR International Activities Team



A-30

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Tuesday, October 23, 2012 8:50 AM  
**To:** Kirk, Mark; Stevens, Gary  
**Subject:** RE: Doel 3 Sharepoint-Site Permissions Changed

Remember that anything you email will be seen by the public at some point in time.

-----  
Aladar A. Csontos, Ph.D  
Chief, Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research  
U.S. Nuclear Regulatory Commission  
21 Church Street M/S 0507M  
Rockville, MD 20852

Office: (301) 251-7640  
Fax: (301) 251-7425  
Email: [aladar.csontos@nrc.gov](mailto:aladar.csontos@nrc.gov)  
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**From:** Kirk, Mark  
**Sent:** Tuesday, October 23, 2012 8:39 AM  
**To:** Stevens, Gary; Csontos, Aladar; Fairbanks, Carolyn; Hardies, Robert; Nove, Carol; Poehler, Jeffrey; Rosenberg, Stacey  
**Subject:** RE: Doel 3 Sharepoint Site Permissions Changed

I'm sure that we all feel much safer now

-----  
**From:** Stevens, Gary  
**Sent:** Tuesday, October 23, 2012 7:32 AM  
**To:** Csontos, Aladar; Fairbanks, Carolyn; Hardies, Robert; Kirk, Mark; Nove, Carol; Poehler, Jeffrey; Rosenberg, Stacey; Stevens, Gary  
**Subject:** Doel 3 Sharepoint Site Permissions Changed

Only those on copy to this e-mail have permission to **contribute** to the subject Sharepoint site.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry: (b)(6)

**Trapp, James**

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**From:** Lupold, Timothy  
**Sent:** Tuesday, October 23, 2012 7:20 AM  
**To:** Trapp, James  
**Cc:** Hardies, Robert  
**Subject:** RE: Vessel Flaws

(b)(5)

information.

**From:** Trapp, James  
**Sent:** Tuesday, October 23, 2012 7:02 AM  
**To:** Lupold, Timothy  
**Subject:** Vessel Flaws

Anything new on the Rotterdam vessel? Thanks

**Kusnick, Joshua**

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**From:** Csontos, Aladar  
**Sent:** Wednesday, October 24, 2012 8:33 AM  
**To:** Stevens, Gary; Kirk, Mark  
**Subject:** Re: doel phone call tomorrow

Cell phone [REDACTED] (b)(6)

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**From:** Stevens, Gary  
**To:** Kirk, Mark; Csontos, Aladar  
**Sent:** Wed Oct 24 08:32:16 2012  
**Subject:** RE: doel phone call tomorrow

Al, what number should we call you at? We will conference you both in.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)  
Office: 301-251-7569  
Blackberry [REDACTED] (b)(6)

**From:** Kirk, Mark  
**Sent:** Tuesday, October 23, 2012 2:07 PM  
**To:** Stevens, Gary  
**Subject:** doel phone call tomorrow

Please call my CELL [REDACTED] (b)(6) Blackberry is on the fritz, and I don't want to spend the 1.5 hours needed to go down to HQ to get it fixed.

Thx

Mark Kirk  
Senior Materials Engineer  
NRC/RES/DE/CIB  
[mark.kirk@nrc.gov](mailto:mark.kirk@nrc.gov)

12-1

**Kirk, Mark**

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**From:** Kirk, Mark  
**Sent:** Thursday, October 25, 2012 3:08 PM  
**To:** Ramsey, Jack; Fehst, Geraldine  
**Subject:** Doel 3 review board meeting

Dear Jack & Gerri –

I wanted to let you know that the leader of the review board I am serving on in Belgium (Professor Labeau) has asked if I can support a second meeting to be held on 17 December (again in Brussels). The purpose of the second meeting (the 1<sup>st</sup> one is scheduled for November 27<sup>th</sup> to 28<sup>th</sup> ... and you should already have the travel request for that) will be to finalize our assessment of Doel 3 for transmission to the FANC. Based on the schedule I have seen for the November 27-28 meeting I think that during the November meeting we will do much listening and discussing, but very little writing. I expect the writing will be done between the meetings. We will therefore need to finalize the writing, compile it, agree on language (& so on) during the meeting on the 17<sup>th</sup>.

Given the attention this matter has received I believe it would be best if I could attend the meeting in December in person. Previously you (OIP) had kindly agreed to cover the cost of my travel (see below for reference). If you are able to support the meeting on the 17<sup>th</sup> I feel it would be most beneficial.

Please let me know your views. If you wish to discuss please call me on my cell

(b)(6)

# 6

Thanks

mark

-----Original Message-----

**From:** Ramsey, Jack  
**Sent:** Friday, August 31, 2012 1:18 PM  
**To:** Csontos, Aladar  
**Cc:** Abrams, Charlotte; Richards, Stuart; Kirk, Mark; Case, Michael; Afshar-Tous, Mugeh; Smith, Wilkins; Sangimino, Donna-Marie; Jackson, Diane; Hopkins, Jon; Rosenberg, Stacey; Schwartzman, Jennifer; Fehst, Geraldine  
**Subject:** RE: Visit to KINS; Kori unit 1 reactor vessel integrity

Al,

Thanks for the heads up on this. Having both the Belgians and the South Koreans ask for our advice/support, in a relatively short amount of time, gives us a very clear message on how seriously the international regulatory community is responding to the RPV integrity questions. In all honesty, it wouldn't surprise me that other countries, the NEA and/or the IAEA might also make similar requests of us.

We think it's a very good idea to support these requests. We're also very glad RES can make Mark available to support them. With this, I think you/yours are ok to respond positively to both the Belgians and the South Koreans. Please keep the OIP desk officers for both countries (Wilkins Smith for South Korea and Gerri Fehst for Belgium) in the loop on any correspondence with their respective countries.

For a variety of reasons I think it's best that NRC not accept any funding from either the Belgians or the South Koreans for provision of this advice/support. With this, I'd like to propose (for at least these initial activities)

that RES cover Mark's time while OIP can cover Mark's travel expenses (that is, if RES is tight on travel funds).

Also, just FYI. Early next week OIP plans on informally advising the Commission of these developments. I'm sure that, as this moves forward, they'll be interested in both how the international community responds to this as well as whether any insight gained internationally might have domestic implications.

Jack

M-17

# RES Management Briefing

*Indications in the Doel 3 (Belgium) Reactor  
Pressure Vessel*

Gary L. Stevens

Sr. Materials Engineer

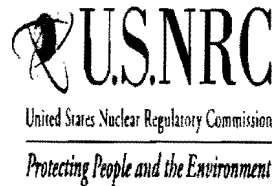
Carol Nove

Materials Engineer

RES/DE/CIB

October 25, 2012

# Background



- Doel 3 is a 1,006 MWe, 3-loop, Framatome-supplied PWR in the Port of Antwerp near the Dutch-Belgian border
  - Began operation in 1982
  - Designed to ASME Code, Section III, 1974 Addenda
  - Reactor pressure vessel (RPV) shell is made of forged rings
    - The raw material was supplied by Krupp
    - The forgings were manufactured by Rotterdamsche Droogdok Maatschappij (RDM) in 1974-1975
    - RPV was installed in 1978



(b)(4)



# 2012 Inspection Results



United States Nuclear Regulatory Commission

*Protecting People and the Environment*

(b)(4)

# 2012 Inspection Results (cont'd)



(b)(4)

# 2012 Inspection Results (cont'd)

U.S. NRC

(b)(4)

# 2012 Inspection Results (cont'd)

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Exempt 11-27  
U

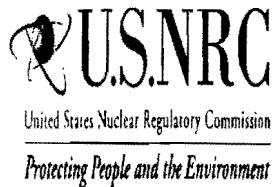
(b)(4)

# 2012 Inspection Results (cont'd)



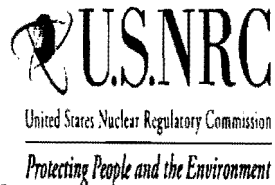
(b)(4)

# Belgian Request for NRC Support

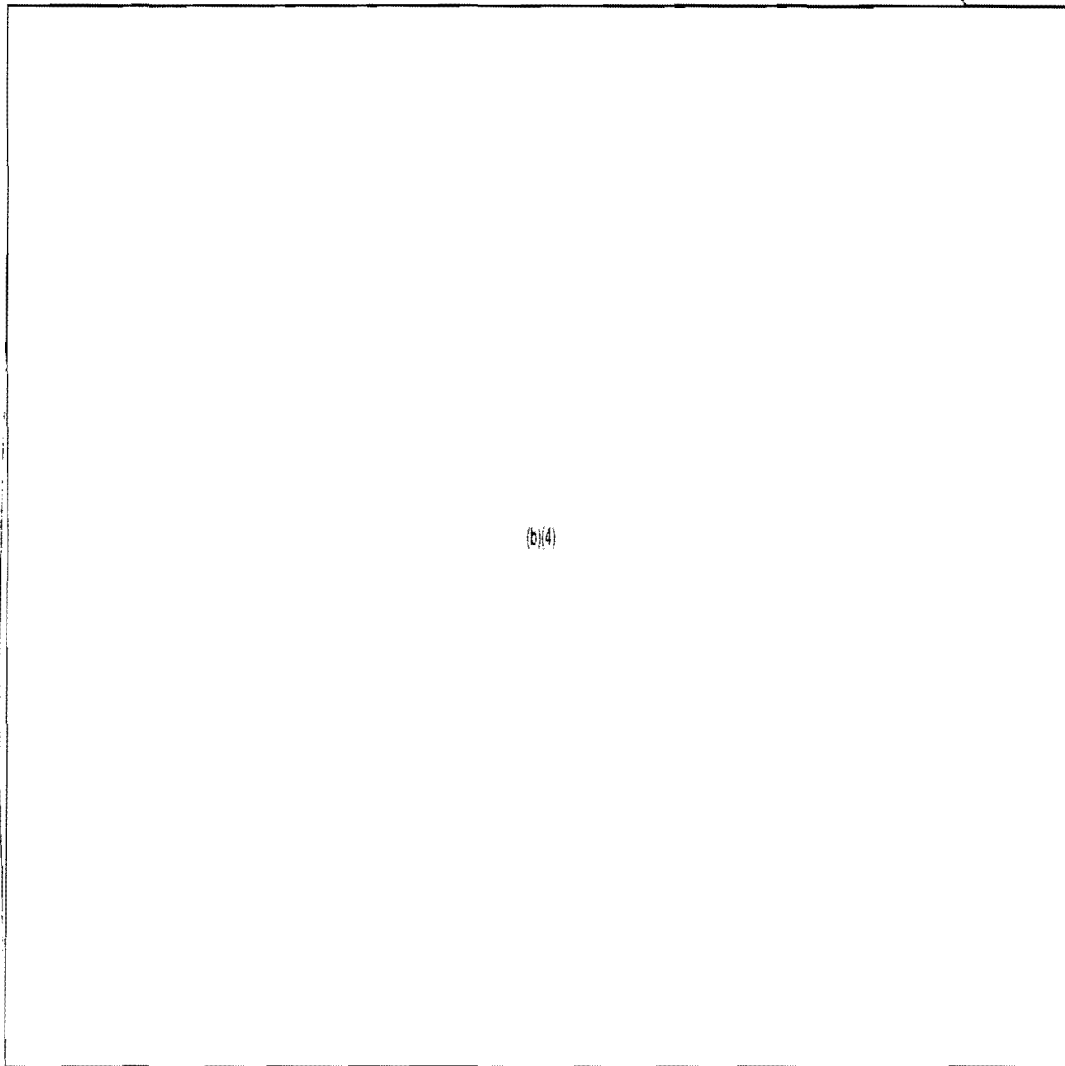


- On 8/28/2012, the Federal Agency for Nuclear Control (FANC) requested NRC support (ML1224A335)
- NRR requested RES support (ML1224A258)
- RES agreed to support NRR request (ML1224A108)
- NRC support to FANC
  - International Expert Review Team
    - Mark Kirk, RES/DE/CIB – meetings to occur later in 2012
  - NRC participation on three technical expert working groups
    - Working Group #1: NDE (Carol Nove, RES/DE/CIB)
    - Working Group #2: Metallurgy (Jeff Poehler, NRR/DE/EVIB)
    - Working Group #3: Fracture Mechanics (Gary Stevens, RES/DE/CIB)
    - NRC liaison to all 3 Working Groups: Bob Hardies, NRR/DE
  - Working Group meetings were held on 10/10/12, 10/11/12, 10/12/12, 10/13/12, 10/15/12, 10/16/12, 10/17/12, 10/18/12, 10/19/12, 10/20/12, 10/21/12, 10/22/12, 10/23/12, 10/24/12, 10/25/12, 10/26/12, 10/27/12, 10/28/12, 10/29/12, 10/30/12, 10/31/12, 11/1/12, 11/2/12, 11/3/12, 11/4/12, 11/5/12, 11/6/12, 11/7/12, 11/8/12, 11/9/12, 11/10/12, 11/11/12, 11/12/12, 11/13/12, 11/14/12, 11/15/12, 11/16/12, 11/17/12, 11/18/12, 11/19/12, 11/20/12, 11/21/12, 11/22/12, 11/23/12, 11/24/12, 11/25/12, 11/26/12, 11/27/12, 11/28/12, 11/29/12, 11/30/12, 12/1/12, 12/2/12, 12/3/12, 12/4/12, 12/5/12, 12/6/12, 12/7/12, 12/8/12, 12/9/12, 12/10/12, 12/11/12, 12/12/12, 12/13/12, 12/14/12, 12/15/12, 12/16/12, 12/17/12, 12/18/12, 12/19/12, 12/20/12, 12/21/12, 12/22/12, 12/23/12, 12/24/12, 12/25/12, 12/26/12, 12/27/12, 12/28/12, 12/29/12, 12/30/12, 12/31/12, 1/1/13, 1/2/13, 1/3/13, 1/4/13, 1/5/13, 1/6/13, 1/7/13, 1/8/13, 1/9/13, 1/10/13, 1/11/13, 1/12/13, 1/13/13, 1/14/13, 1/15/13, 1/16/13, 1/17/13, 1/18/13, 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# Working Group #1 Meeting



- Overview of findings in the reactor shells of Doel 3 and Tihange 2
- Presentations by WG members on recent experience:



(b)(4)

# Working Group #1 Meeting – Civa Simulation

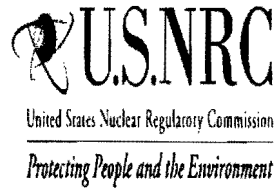


United States Nuclear Regulatory Commission

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# Working Group #2 Meeting



- Jeff Poehler (NRR/DE/EVIB) attended

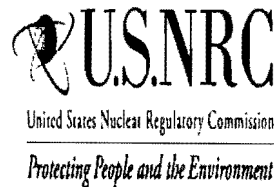
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# Working Group #3 Meeting



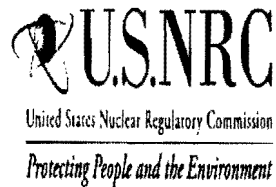
- Gary Stevens (RES/DE/CIB) attended
- Gary to provide....

# Industry Actions



- On 10/10/12, EPRI held a debrief call with NRC with regards to their activities associated with Doel 3
- EPRI coordinated a visit of 6 U.S. representatives to Belgium on 9/19/12
  - The meeting was requested by WANO and Electrabel
- EPRI summarized the meeting
  - It was apparent from their summary that NRC has more information than EPRI
- EPRI has no current plans to return to Belgium
  - They will continue correspondence on NDE issues, primarily to understand the ramifications for U.S. plants

## Industry Actions (cont'd)



- EPRI/industry has not identified any actions for U.S. plants yet
  - They will continue to monitor and review results and then make informed decisions when the timing is right

# Results of NRR/RES Debrief



- Later.....

# Next Steps



- Later.....

M-8


# RES Management Briefing

## *Indications in the Doel 3 (Belgium) Reactor Pressure Vessel*

Gary L. Stevens  
Sr. Materials Engineer

Carl Nove  
Materials Engineer  
RES/DE/CIB


October 25, 2012



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


NRC INTERNAL USE ONLY

### Background



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

- Doel 3 is a 1,006 MWe, 3-loop, Framatome-supplied PWR in the Port of Antwerp near the Dutch-Belgian border
  - Began operation in 1982
  - Designed to ASME Code, Section III, 1974 Addenda
  - Reactor pressure vessel (RPV) shell is made of forged rings
    - The raw material was supplied by Krupp
    - The forgings were manufactured by Rotterdamsche Droogdok Maatschappij (RDM) in 1974-1975
    - RPV was installed in 1978



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## Belgian Request for NRC Support



- On 8/28/2012, the Federal Agency for Nuclear Control (FANC) requested NRC support (ML1224A335)
- NRR requested RES support (ML1224A258)
- RES agreed to support NRR request (ML1224A108)
- NRC support to FANC
  - International Expert Review Team
    - Mark Kirk, RES/DE/CIB – meeting on November 27/28 in Belgium
  - NRC participation on three technical expert working groups
    - Working Group #1: NDE (Carol Nove, RES/DE/CIB)
    - Working Group #2: Metallurgy (Jeff Poehler, NRR/DE/EVIB)
    - Working Group #3: Fracture Mechanics (Gary Stevens, RES/DE/CIB)
    - NRC liaison to all 3 Working Groups: Bob Hardies, NRR/DE
  - Working Group meetings held on 10/16/12 in Brussels

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## Working Group #1 Meeting



- Carol Nove (RES/DE/CIB) attended
- Overview of findings in the reactor shells of Doel 3 and Tihange 2

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- Discussions on documents provided by licensee prior to meeting
- Question and answer session with licensee person

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## Working Group #2 Meeting



- Jeff Poehler (NRR/DE/EVIB) attended

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## Working Group #3 Meeting



- Gary Stevens (RES/DE/CIB) attended
- 22 attendees from around the world
- Agenda:
  - Introductory remarks by Chairman (Guy Roussel, Bel V)
  - Some national regulatory views on structural integrity
    - Sweden
    - UK
  - Exchange of views about the safety topics provided by Chairman
    - Presentations on topics by some members:
      - Spain (CSN), France (ASN), Japan (JNES), Netherlands (iLENT), European Commission
    - Free discussion
- No discussion on technical reports (next meeting)

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## Working Group #3 Meeting (cont'd)



- Generally, attendees of WG3 felt that:

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## Industry Actions



- Industry engaged via NEI 03-08
- On 10/10/12, EPRI held a debrief call with NRC on their activities in response to Doel 3
- EPRI coordinated a visit of 6 U.S. representatives to Belgium on 9/19/12
  - The meeting was requested by WANO and Electrabel
- EPRI summarized the meeting
  - It was apparent from their summary that NRC has more information than EPRI
- EPRI has no current plans to return to Belgium
  - They will continue correspondence on NDE issues, prime understand the ramifications for U.S. plants

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## Industry Actions (cont'd)



- EPRI/industry has not identified any actions for U.S. plants yet
  - They will continue to monitor and review results and then make informed decisions when the timing is right

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## Results of NRR/RES Debrief



- On Monday (10/23), NRR/RES met for a trip debrief
  - Hardies, Poehler, Stevens, Nove, Kirk, Fairbanks
- RES (Carol and Gary) are awaiting direction
- NRR plans:
  - Addressing recent FOIA
  - E. Leeds brief
  - Executive Team brief on Thursday
  - 1-page brief for Chairman
  - Potential Commissioners' TA brief
  - Trip report
  - Public meeting to be scheduled in December
  - Bilateral with France in December

### U.S. Vessels That May Have RDM Forgings

|                |
|----------------|
| Catawba 1      |
| McGuire 2      |
| North Anna 1&2 |
| Quad Cities 2  |
| Sequoyah 1&2   |
| Watts Bar 1&2  |

31 plants in U.S. have forged vessels from Crausot-Loire, RDM, JSW, Lohsh, Barmbham Steel

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NRC INT

## Status/Next Steps



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- FANC has requested further NRC support
  - WG3 support requested by FANC (so far) is estimated as 0.5 FTE through 12/31/12 and another 1-week trip to Belgium
  - WG1 and WG3 support has not been requested yet, other than another trip to Belgium
  - Int'l Expert Group (Kirk) – 1 or 2 meetings in Belgium plus document review
- NRR is briefing their management on this issue

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## Status/Next Steps (cont'd)



- RES is meeting with NRR Monday p.m. to discuss next steps:
  - Develop recommendations for additional work on this issue
    - Provide direct support to NRR for addressing this issue in U.S. plants
    - Assist the Belgians to address issues with Doel 3 and Tihange 2 that have implications for U.S. plants
  - Establish resource estimates

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12-4  
**Kirk, Mark**

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**From:** Kirk, Mark  
**Sent:** Friday, October 26, 2012 9:19 AM  
**To:** Mark  
**Subject:** FW: Doel 3 review board meeting

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**From:** Ramsey, Jack  
**Sent:** Friday, October 26, 2012 7:32 AM  
**To:** Kirk, Mark  
**Cc:** Fehst, Geraldine; Sangimino, Donna-Marie; Barnes, Robin  
**Subject:** RE: Doel 3 review board meeting

Mark,

Thanks for the update on the Doel situation. I agree that participating in both meetings is important. As such, I'm ok paying for your travel to attend both.

Jack

**From:** Kirk, Mark  
**Sent:** Thursday, October 25, 2012 3:08 PM  
**To:** Ramsey, Jack; Fehst, Geraldine  
**Subject:** Doel 3 review board meeting

Dear Jack & Gerri –

I wanted to let you know that the leader of the review board I am serving on in Belgium (Professor Labeau) has asked if I can support a second meeting to be held on 17 December (again in Brussels). The purpose of the second meeting (the 1st one is scheduled for November 27th to 28th ... and you should already have the travel request for that) will be to finalize our assessment of Doel 3 for transmission to the FANC. Based on the schedule I have seen for the November 27-28 meeting I think that during the November meeting we will do much listening and discussing, but very little writing. I expect the writing will be done between the meetings. We will therefore need to finalize the writing, compile it, agree on language (& so on) during the meeting on the 17th.

Given the attention this matter has received I believe it would be best if I could attend the meeting in December in person. Previously you (OIP) had kindly agreed to cover the cost of my travel (see below for reference). If you are able to support the meeting on the 17th I feel it would be most beneficial.

Please let me know your views. If you wish to discuss please call me on my cell

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Thanks



mark

-----Original Message-----

From: Ramsey, Jack

Sent: Friday, August 31, 2012 1:18 PM

To: Csontos, Aladar

Cc: Abrams, Charlotte; Richards, Stuart; Kirk, Mark; Case, Michael; Afshar-Tous, Mugeh; Smith, Wilkins; Sangimino, Donna-Marie; Jackson, Diane; Hopkins, Jon; Rosenberg, Stacey; Schwartzman, Jennifer; Fehst, Geraldine

Subject: RE: Visit to KINS; Kori unit 1 reactor vessel integrity

Al,

Thanks for the heads up on this. Having both the Belgians and the South Koreans ask for our advice/support, in a relatively short amount of time, gives us a very clear message on how seriously the international regulatory community is responding to the RPV integrity questions. In all honesty, it wouldn't surprise me that other countries, the NEA and/or the IAEA might also make similar requests of us.

We think it's a very good idea to support these requests. We're also very glad RES can make Mark available to support them. With this, I think you/yours are ok to respond positively to both the Belgians and the South Koreans. Please keep the OIP desk officers for both countries (Wilkins Smith for South Korea and Gerri Fehst for Belgium) in the loop on any correspondence with their respective countries.

For a variety of reasons I think it's best that NRC not accept any funding from either the Belgians or the South Koreans for provision of this advice/support. With this, I'd like to propose (for at least these initial activities) that RES cover Mark's time while OIP can cover Mark's travel expenses (that is, if RES is tight on travel funds).

Also, just FYI. Early next week OIP plans on informally advising the Commission of these developments. I'm sure that, as this moves forward, they'll be interested in both how the international community responds to this as well as whether any insight gained internationally might have domestic implications.

Jack

K-3  
**Kirk, Mark**

---

**From:** Kirk, Mark  
**Sent:** Friday, October 26, 2012 9:37 AM  
**To:** Nove, Carol; Stevens, Gary  
**Subject:** RE: Nondestructive Examination of VB395 block

I understand.

May i suggest that a follow-up e-mail would be in order.

Since you agreed with my assessment of the report, i think it would be good to demonstrate to the Belgians that we have read and understood the information they have provided us.

Would you agree to send a follow-on e-mail asking about the availability of material from the remainder of the steam generator shell for testing? This could be seen as an alternative, a "Plan B" if you will ... a Plan to which it might be much easier for them to agree to.

I think we should structure the question in a manner that promotes the answer we want ... which is to get some material.

---

**From:** Nove, Carol  
**Sent:** Friday, October 26, 2012 9:33 AM  
**To:** Kirk, Mark; Stevens, Gary  
**Subject:** RE: Nondestructive Examination of VB395 block

Already sent...

I'll be surprised if I get anything more back from them than "no can do" and that is fine...my aim was to follow through on Jennifer's request and put the thought in their minds that we might want some material here in the US to do some testing.

-----Original Message-----

**From:** Kirk, Mark  
**Sent:** Friday, October 26, 2012 9:26 AM  
**To:** Nove, Carol; Stevens, Gary  
**Subject:** RE: Nondestructive Examination of VB395 block

Carol -

Sorry, i missed this in the flurry of e-mails about FOIA sent yesterday.

I do not think that you should send this e-mail.

(b)(4)

(b)(5)

mark

---

From: Nove, Carol  
Sent: Thursday, October 25, 2012 2:49 PM  
To: Stevens, Gary; Kirk, Mark  
Subject: Nondestructive Examination of VB395 block

Gary and Mark,

Before I send the following off to my WG secretary and chair, I would appreciate your feedback as to whether you think I have done an adequate job at pushing for more NDE or other material per our meeting with Jennifer this morning.

Thanks,  
Carol

Dear Frederik and Andre,

It was a pleasure to meet you both last week. I learned a great deal at our meeting, and found the discussions to be very interesting.

(b)(4)

Lastly, when will the presentations from WG1 will be available to us? I would like to be able to share some of the NDE images as well as flaw size distributions with my colleagues here at the NRC.

Thank you very much,  
Carol Nove

16-7

----- Original Message -----

**From:** Mark Kirk

**To:** Labeau Pierre-Etienne ; benedikt.martens@sckcen.be

**Cc:** [helmut.Schulz\\_krtn@t-online.de](mailto:helmut.Schulz_krtn@t-online.de) ; [andre.pineau@mines-paristech.fr](mailto:andre.pineau@mines-paristech.fr) ; [timwilliams@39bhr.fsnet.co.uk](mailto:timwilliams@39bhr.fsnet.co.uk) ; [kim.wallin@vtt.fi](mailto:kim.wallin@vtt.fi) ; [stivims@ims.bas.bg](mailto:stivims@ims.bas.bg) ; [ki-sig.kang@iaea.org](mailto:ki-sig.kang@iaea.org) ; [Alejandro.HUERTA@oecd.org](mailto:Alejandro.HUERTA@oecd.org) ; [willy.deroovere@fanc.fgov.be](mailto:willy.deroovere@fanc.fgov.be)

**Sent:** Tuesday, October 30, 2012 3:21 PM

**Subject:** some comments on Tractebel documents

Dear Benedikt (& others) -

Please forgive the last blank e-mail you received from me. My clumsy thumbs pressed "send" prematurely.

Due to a late season hurricane on the east coast of the United States that has stranded me at home, i have had two uninterrupted days during which i have taken the opportunity to review some of the documents that have been provided to us by Tractebel. In specific i have made my way through all documents provided so far in the categories of:

- calculations
- safety
- strategy note

Following instructions from Professor Labeau i am sending you these comments (attached) in the hope that Tractebel may be informed of them so that the more important ones can be addressed during our meetings in late November. Also, i should note that all of these comments fall into Professor Labeau's "Category 1," i.e., those related to the general consistency of Electrabel's justification case.

Before anyone delves into the details of my comments i wish to say that overall i found the documents provided so far by Tractebel (those i have read) to be of extremely high quality and thoroughness. Even though i have identified some major technical comments i am nevertheless optimistic that they can be resolved in a satisfactory manner.

In the interest of clarity i have adopted a standardized format for my comments, which is attached. There is a separate comment file for each document i have read; it is designated by the 3 digit identification provided as part of the title within the "Electrabel Deliverables List" spreadsheet you provided previously. Also, with a view to communicating the relative importance of my various comments, and also what i hope can happen in response to my comments, i have categorized each comment as being one of the following five types:

| Type ID   | Definition                                                                                                              |
|-----------|-------------------------------------------------------------------------------------------------------------------------|
| Editorial | Just something that was noticed. Provided for information.                                                              |
| Info      | Additional explanation and/or information is suggested to clarify/improve the strength and/or logic of the safety case. |

|                   |                                                                                                                                                         |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Tech-Minor</b> | A technical comment having limited impact on the safety case.<br>Address of this comment would improve the safety case, but is not viewed as necessary. |
| <b>Tech-Major</b> | A technical comment having significant impact on the safety case.<br>Address of this comment is viewed as necessary.                                    |
| <b>Expansion</b>  | A suggested expansion of the proposed argument that is viewed as augmenting the strength of the safety case.                                            |

It is of course the "Tech-Major" comments that i particularly hope Tractebel will be able to give some thought to before our meeting at the end of November.

Finally i should note that the two attached pdf files are referenced from within some of my comments.

Please let me know if you have any questions or concerns.

Best regards,

Mark

**Mark Kirk**  
**Senior Materials Engineer**  
**Office of Nuclear Regulatory Research**  
**United States Nuclear Regulatory Commission**

Document #: 8.1.1

Document Title: 10010363730\_000\_00. "Strategy for drafting the Doel 3 and Tihange 2 restart file"

Commenter: Mark Kirk, mark.kirk@nrc.gov

Date: 30<sup>th</sup> October 2012

| ID      | Location           | Type       | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Resolution |
|---------|--------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 8.1.1-1 | Sect. 1            | Info       | The statement is made (b)(4)<br>(b)(4) Is it possible to see this document?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |
| 8.1.1-2 | Sect. 3            | Tech-Major | The statement is made (b)(4)<br>(b)(4) Certainly brittle initiation is to be guarded against, and is the most worrisome outcome.<br>(b)(5) Can you please say how your analysis addresses the preclusion of ductile crack initiation, or argue what it is not necessary to do so?                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |
| 8.1.1-3 | Sect. 7.3          | Tech-Minor | The statement is made (b)(4)<br>(b)(4)<br>(b)(4) This statement seems speculative unless it can be referenced that such segregations were actually observed in the original large scale specimens that led to the ASME $K_{IC}$ and $K_{IS}$ curves.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |
| 8.1.1-4 | N/A                | N/A        | Never mind. I resolved this myself.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |
| 8.1.1-5 | N/A                | N/A        | Never mind. I resolved this myself.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |
| 8.1.1-6 | Sect 7.5.1 & 7.5.2 | Tech-Major | In 7.5.1 it is stated that the deterministic (ASME) assessment is performed (b)(4)<br>(b)(4) However, in 7.5.2 the probabilistic analysis is performed only for PTS (i.e., accident) conditions. As I understand your explanation a key motivation of performing the probabilistic analysis is to deal more realistically with the very large number of indications found in Doel 3 and Tihange 2. As such, what is the justification for restricting the scope of loading cases modeled using the probabilistic analysis to only those resulting from accident loadings? Should not normal loadings be considered as well so that the effects of the very large number of indications found in Doel 3 and Tihange 2 can be assessed for those loading types? |            |

| Type ID    | Definition                                                                                                                                              |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Editorial  | Just something that was noticed. Provided for information.                                                                                              |
| Info       | Additional explanation and/or information is suggested to clarify/improve the strength and/or logic of the safety case.                                 |
| Tech-Minor | A technical comment having limited impact on the safety case.<br>Address of this comment would improve the safety case, but is not viewed as necessary. |
| Tech-Major | A technical comment having significant impact on the safety case.<br>Address of this comment is viewed as necessary.                                    |
| Expansion  | A suggested expansion of the proposed argument that is viewed as augmenting the strength of the safety case.                                            |

Document #: 4.0.1

Document Title: Calculations : RPV Doel 3 - Methodology for the justification of the indications in Doel 3 reactor pressure vessel

Commenter: Mark Kirk, [mark.kirk@nrc.gov](mailto:mark.kirk@nrc.gov)

Date: 30<sup>th</sup> October 2012

| ID      | Location                                | Type       | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Resolution |
|---------|-----------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4.0.1-1 | Sections 4.1.2.1, 4.1.3.1, maybe others | Info       | Several proprietary computer codes have been used in these analyses (e.g., SYSTUS, TRTHERM, TEEPAC, maybe others). Please provide evidence / documentation demonstrating that the solutions provided by these codes have been benchmarked to reference solutions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |
| 4.0.1-2 | Sections 4.1.3 & 4.2                    | Tech-Major | <p>This comment will apply to many documents.</p> <p>(b)(4)</p> <p>To this reviewer's knowledge, the Doel and Tihange safety cases will be unprecedented in the degree to which their outcome will (probably) depend on flaw orientation and combination rules. With this in mind it is viewed as critically important by this reviewer that the basis for and application of these rules be clearly described and understood. Having a document dedicated to that purpose, such as the 4.3.1 document, is an excellent idea.</p> <p>I have attached to these comments a copy of EPRI Report NP-719-SR. Appendix E of this document describes the basis for ASME's flaw orientation and combination rules. As described by the last paragraph on page E-4 of Appendix E, the ASME combination rules are non conservative (up to 20% under-prediction of <math>K_{APPLIED}</math>) for the case of equi-biaxial loading that arises during thermal transients. Demonstration that such non-</p> |            |

| ID      | Location    | Type       | Comment                                                                                        | Resolution |
|---------|-------------|------------|------------------------------------------------------------------------------------------------|------------|
|         |             |            | conservatism is not a characteristic of the Tractebel procedure will, of course, be important. |            |
| 4.0.1-3 | Section 5.1 | Tech-Minor | Same as comment 7.4.1-3                                                                        |            |

| Type ID    | Definition                                                                                                                                              |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Editorial  | Just something that was noticed. Provided for information.                                                                                              |
| Info       | Additional explanation and/or information is suggested to clarify/improve the strength and/or logic of the safety case.                                 |
| Tech-Minor | A technical comment having limited impact on the safety case.<br>Address of this comment would improve the safety case, but is not viewed as necessary. |
| Tech-Major | A technical comment having significant impact on the safety case.<br>Address of this comment is viewed as necessary.                                    |
| Expansion  | A suggested expansion of the proposed argument that is viewed as augmenting the strength of the safety case.                                            |



Document #: 4.1.1

Document Title: Calculations : RPV Doel 3 – Input data and hypotheses for the structural integrity assessment of the flaws

Commenter: Mark Kirk, [mark.kirk@nrc.gov](mailto:mark.kirk@nrc.gov)

Date: 30<sup>th</sup> October 2012

| ID      | Location             | Type       | Comment                                                                                                                                                                                                                                                                                                  | Resolution |
|---------|----------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4.1.1-1 | Sect 3.5.4 & Table 9 | Expansion  | I am glad to see that (b)(4)                                                                                                                                                                                                                                                                             |            |
|         |                      |            | (b)(4)                                                                                                                                                                                                                                                                                                   |            |
|         |                      |            | (b)(4) In a paper presented at the 2011 PVP conference (PVP2011-57173, which I have attached) a number of co-authors and I examined the effect of upper shelf limiting the transition fracture toughness curve based on data available for a large variety of RPV steels. The relationship we developed, |            |
|         |                      |            | $K_{Ic}^{LIMIT} = 151.771 \times \exp(-0.00271 \times RT_{10})$                                                                                                                                                                                                                                          |            |
|         |                      |            | permits calculation of a 2.5% lower bound value of $K_{Ic}^{LIMIT}$ based on an input value of $RT_{NDT}$ [or $RT_{10}$ ].                                                                                                                                                                               |            |
| 4.1.1-2 | Sect 3.6             | Info       | (b)(4)                                                                                                                                                                                                                                                                                                   |            |
|         |                      |            | (b)(4)                                                                                                                                                                                                                                                                                                   |            |
|         |                      |            | (b)(5)                                                                                                                                                                                                                                                                                                   |            |
| 4.1.1-3 | Sect 3.6             | Tech-Major | (b)(4)                                                                                                                                                                                                                                                                                                   |            |
| 4.1.1-4 | Sect 4               | Info       | Please provide a plot of the data that leads to the use of a maximum angle of 20°, or provide a reference to where these data can be found.                                                                                                                                                              |            |

| Type ID    | Definition                                                                                                                                              |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Editorial  | Just something that was noticed. Provided for information.                                                                                              |
| Info       | Additional explanation and/or information is suggested to clarify/improve the strength and/or logic of the safety case.                                 |
| Tech-Minor | A technical comment having limited impact on the safety case.<br>Address of this comment would improve the safety case, but is not viewed as necessary. |
| Tech-Major | A technical comment having significant impact on the safety case.<br>Address of this comment is viewed as necessary.                                    |
| Expansion  | A suggested expansion of the proposed argument that is viewed as augmenting the strength of the safety case.                                            |

Document #: 4.2.1

Document Title: Calculations – RPV Doel 3- ASME-III Justification

Commenter: Mark Kirk, [mark.kirk@nrc.gov](mailto:mark.kirk@nrc.gov)

Date: 30<sup>th</sup> October 2012

| ID      | Location | Type | Comment                                                                                                                                                       | Resolution |
|---------|----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4.2.1-1 | Sect 5   | Info | I understand that at the end of this section (b)(5)                                                                                                           |            |
|         |          |      | (b)(5)                                                                                                                                                        |            |
|         |          |      | As one specific comment/question, it is stated that:                                                                                                          |            |
|         |          |      | (b)(4)                                                                                                                                                        |            |
|         |          |      | I assume that the 1 <sup>st</sup> sentence refers to information provided in Section 3.2, about the as-designed (no flaw) condition, for which:               |            |
|         |          |      | (b)(4)                                                                                                                                                        |            |
|         |          |      | So I further assume that the 2 <sup>nd</sup> sentence is implying that because the other as-designed values are far below the Section III requirements, i.e., |            |
|         |          |      | (b)(4)                                                                                                                                                        |            |

| ID      | Location | Type       | Comment                                                                                | Resolution |
|---------|----------|------------|----------------------------------------------------------------------------------------|------------|
|         |          |            | then the other requirements are trivially satisfied. Do I understand correctly? (b)(5) |            |
|         |          |            | (b)(5)                                                                                 |            |
| 4.2.1-2 | Sect 6   | Tech-Major | The statement is made: (b)(4)                                                          |            |
|         |          |            | (b)(4) (b)(5)                                                                          |            |
|         |          |            | (b)(5)                                                                                 |            |
|         |          |            | (b)(5)                                                                                 |            |
| 4.2.1-3 | Sect 6   | Tech-Major | (b)(4)                                                                                 |            |
|         |          |            | (b)(4) (b)(5)                                                                          |            |
|         |          |            | (b)(5)                                                                                 |            |

| Type ID    | Definition                                                                                                                                              |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Editorial  | Just something that was noticed. Provided for information.                                                                                              |
| Info       | Additional explanation and/or information is suggested to clarify/improve the strength and/or logic of the safety case.                                 |
| Tech-Minor | A technical comment having limited impact on the safety case.<br>Address of this comment would improve the safety case, but is not viewed as necessary. |
| Tech-Major | A technical comment having significant impact on the safety case.<br>Address of this comment is viewed as necessary.                                    |
| Expansion  | A suggested expansion of the proposed argument that is viewed as augmenting the strength of the safety case.                                            |

Document #: 4.3.5

Document Title: Calculations : RPV Doel 3 – Tihange 2: Methodology for the determination of the acceptable flaw sizes

Commenter: Mark Kirk, [mark.kirk@nrc.gov](mailto:mark.kirk@nrc.gov)

Date: 30<sup>th</sup> October 2012

| ID      | Location       | Type       | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Resolution |
|---------|----------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4.3.5-1 | Sect 2.4       | Info       | Based on what I have read in other documents I assume that $RT_{NDT} = 45.6^{\circ}\text{C}$ corresponds to the measured $RT_{NDT}$ associated with the 4 <sup>th</sup> surveillance capsule, while $RT_{NDT} = 100^{\circ}\text{C}$ corresponds to this same value adjusted (based on current assumptions) to account for segregation effects. Is this correct? In any event, it would be informative to say what the motivation is for assessing this range of $RT_{NDT}$ values. |            |
| 4.3.5-2 | Sect 2.5       | Info       | I assume that the (b)(4) is defined as the one that leads to the smallest allowable defect size, correct?                                                                                                                                                                                                                                                                                                                                                                           |            |
| 4.3.5-3 | Sect 2.5       | Tech-Major | (b)(4)<br><br>What is the justification for considering different Level C/D transients in the assessment of acceptable flaw sizes than are shown by the probabilistic analysis to be important risk contributors? If these two analyses (i.e., those presented in this document and those presented in document 4.S.1) do not need to be consistent, please explain why.                                                                                                            |            |
| 4.3.5-4 | Sect 4.1 & 4.2 | Tech-Major | Same as comment 4.0.1-2.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |            |
| 4.3.5-5 | Sect 4.3       | Info       | I am probably revealing my ignorance, but additional explanation of the technical basis for these equations would be greatly appreciated:<br><br>(b)(4)                                                                                                                                                                                                                                                                                                                             |            |

| ID      | Location   | Type | Comment                                                                                                                                                                                                                                                                                                                    | Resolution |
|---------|------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4.3.5-6 | Throughout | Info | Same as comment 4.0.1-1.                                                                                                                                                                                                                                                                                                   |            |
| 4.3.5-7 | Sect 4.5   | Info | The status of this document is "FIN" (meaning final, I assume), yet the critical flaw size curves given here are said to be only an example. I assume that a future revision of this document, or some other document, will provide critical flaw size curves for the broad range of parameters outlined in this document? |            |

| Type ID    | Definition                                                                                                                                              |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Editorial  | Just something that was noticed. Provided for information.                                                                                              |
| Info       | Additional explanation and/or information is suggested to clarify/improve the strength and/or logic of the safety case.                                 |
| Tech-Minor | A technical comment having limited impact on the safety case.<br>Address of this comment would improve the safety case, but is not viewed as necessary. |
| Tech-Major | A technical comment having significant impact on the safety case.<br>Address of this comment is viewed as necessary.                                    |
| Expansion  | A suggested expansion of the proposed argument that is viewed as augmenting the strength of the safety case.                                            |

Document #: 4.5.1

Document Title: 10CFR50.61a PTS study of the KCD3 reactor pressure vessel probabilistic approach

Commenter: Mark Kirk, [mark.kirk@nrc.gov](mailto:mark.kirk@nrc.gov)

Date: 30<sup>th</sup> October 2012

| ID      | Location             | Type       | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Resolution |
|---------|----------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4.5.1-1 | Sect 5.1.2           | Tech-Minor | Same comment as 7.4.1-3.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |
| 4.5.1-2 | Sect 6.1.1           | Editorial  | I suspect the reference to "Section 0" is in error.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |
| 4.5.1-3 | Sect 6, 7.3.2, 7.3.3 | Info       | As recognized by Tractebel, a key part of this analysis is demonstrating that the Beaver Valley 1 transients are appropriately assumed for Doel 3. This argument is presented in the mentioned locations. I am probably revealing that I am not a systems engineer when I say that I found the information presented in these sections to be a bit over my head. I hope it will be easier to understand the information presented in these sections, and the importance thereof, following direct discussions with Tractebel engineers. |            |
| 4.5.1-4 | Sect 7.3.2.3         | Info       | Please document the means by which the frequencies of transient occurrence were estimated for Doel 3.                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |
| 4.5.1-5 | Sect 7.2.1.1         | Info       | Was the best estimate chemistry for the lower shell used for both the lower and the upper shells? Why is this appropriate?                                                                                                                                                                                                                                                                                                                                                                                                              |            |
| 4.5.1-6 | Sect 7.2.1.2         | Tech-Major | Same as comment 4.0.1-2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |
| 4.5.1-7 | Sect 7.2.1.2         | Tech-Major | <div>(b)(4)</div> <div>(b)(4)</div> <div>It is difficult to visualize based what is written in this section what the mathematical model of the flaws in the vessel looks like, and how this compares to the NDE data. Please provide some visual, tabular, and/or graphical comparisons to demonstrate that the mathematical model is an accurate or conservative representation of the NDE data for Doel 3.</div>                                                                                                                      |            |
| 4.5.1-8 | Sect 7.2.1.2         | Tech-Minor | <div>While I agree with the following statement:</div> <div>(b)(4)</div> <div>for the low embrittlement level of the welds themselves (-2 °C) and the surrounding forgings (28 °C) the relationships between <math>RT_{MAX-AW}</math> and TWCF in NUREG-1874 suggest that there should be no [zero] TWCF (and therefore zero FCI) associated with the flaws in the welds. It may therefore be worth noting that all of the FCI estimated in these analyses is thought to arise due to the quasi-laminar flaws.</div>                    |            |

| ID       | Location     | Type       | Comment                                                                                                                                                                                                                                                                                                                                                                                                            | Resolution |
|----------|--------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4.5.1-9  | Sect 7.2.1.4 | Tech-Major | The FAVOR code does not model flaw interactions; all simulated flaws are assumed to exist in isolation from one another. While it has not been explicitly stated, I assume that flaw interaction is addressed as a pre-processing step by grouping nearby flaws together. In any event, how flaw interaction has been accounted for, or the fact that it does not need to be accounted for, needs to be described. |            |
| 4.5.1-10 | Sect 7.2.1.4 | Tech-Major | (b)(4)<br>(b)(4) Please assess the impact of this limitation on the ability to model accurately (or conservatively) the flaw population found in the Doel 3 RPV.                                                                                                                                                                                                                                                   |            |
| 4.5.1-11 | Sect 7.2.1.5 | Tech-Major | Same comment as 8.1.1-6.                                                                                                                                                                                                                                                                                                                                                                                           |            |

| Type ID    | Definition                                                                                                                                              |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Editorial  | Just something that was noticed. Provided for information.                                                                                              |
| Info       | Additional explanation and/or information is suggested to clarify/improve the strength and/or logic of the safety case.                                 |
| Tech-Minor | A technical comment having limited impact on the safety case.<br>Address of this comment would improve the safety case, but is not viewed as necessary. |
| Tech-Major | A technical comment having significant impact on the safety case.<br>Address of this comment is viewed as necessary.                                    |
| Expansion  | A suggested expansion of the proposed argument that is viewed as augmenting the strength of the safety case.                                            |

Document #: 4.6.1

Document Title: Calculation: RPV Doel 3 : Fatigue crack growth analysis

Commenter: Mark Kirk, [mark.kirk@nrc.gov](mailto:mark.kirk@nrc.gov)

Date: 30<sup>th</sup> October 2012

| ID      | Location     | Type       | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Resolution |
|---------|--------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4.6.1-1 | Sect. 2      | Tech-Major | Same as comment 4.0.1-2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |
| 4.6.1-2 | Sect. 3.3    | Info       | The number of cycles assumed in 40 years seems to be greatly conservative (e.g., 200 full heatups and cooldowns per year → 5 per year). If this is indeed an intentional conservatism it is probably worth mentioning.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |
| 4.6.1-3 | Sect 3.4 & 4 | Tech-Major | <div>(b)(4)</div> <p>These points are, in my opinion, well demonstrated by these analyses.</p> <div>(b)(5)</div> <div>(b)(5)</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |
| 4.6.1-4 | Various      | Info       | Same comment as 4.0.1-1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |
| 4.6.1-5 | Sect. 5.2.3  | Info       | <p>I can accept that Tractebel has performed the FCG calculations correctly, but I feel that this section should be re-written to better describe what their procedure does, or does not, do. In specific I think that the re-write should describe better the following points:</p> <ol style="list-style-type: none"><li>1. What procedures are used to account for the effect of loading sequence on the calculation? If the effect of loading sequence is ignored, why is it appropriate to do so?</li><li>2. It is said that stress ratio (R-factor) is computed, but it is not clear that the value of R influences the FCG computation following the Paris law. What is the effect of R factor, if any, on the calculation? If R factor is ignored why is it appropriate to do so?</li><li>3. The following statement is made:<div>(b)(4)</div></li><li>4. The following statements are made:</li></ol> <p>This passage speaks only of "pressure evolution." Does this imply that the affects of thermal loading on K is not considered in the FCG analysis? If so why is this appropriate?</p> |            |



| ID | Location | Type | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Resolution |
|----|----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
|    |          |      | <div style="border: 1px solid black; height: 150px; width: 100%; display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; padding: 5px;">(b)(4)</div> </div> <p>It is probably due to my unfamiliarity with ASME FCG protocols, but I have had great difficulty understanding what these sentences are trying to tell me regarding how the <math>\Delta K</math> values and the number of cycles are computed from the information in the table given in Section 3.3 for input into the FCG calculation. The addition of a few details for the unfamiliar would be most welcome.</p> |            |

| Type ID    | Definition                                                                                                                                              |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Editorial  | Just something that was noticed. Provided for information.                                                                                              |
| Info       | Additional explanation and/or information is suggested to clarify/improve the strength and/or logic of the safety case.                                 |
| Tech-Minor | A technical comment having limited impact on the safety case.<br>Address of this comment would improve the safety case, but is not viewed as necessary. |
| Tech-Major | A technical comment having significant impact on the safety case.<br>Address of this comment is viewed as necessary.                                    |
| Expansion  | A suggested expansion of the proposed argument that is viewed as augmenting the strength of the safety case.                                            |

Document #: 7.4.1

Document Title: Safety Referential: Doel - Reactor Vessel Integrity of Doel 3

Commenter: Mark Kirk, [mark.kirk@nrc.gov](mailto:mark.kirk@nrc.gov)

Date: 30<sup>th</sup> October 2012

| ID      | Location   | Type       | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Resolution |
|---------|------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 7.4.1-1 | Sect 3.1.1 | Info       | Can we get a copy of Royal Decree of 30 November 3011, articles 20 and 24 on aging management?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |            |
| 7.4.1-2 | N/A        | N/A        | Never mind. I resolved this question myself.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |
| 7.4.1-3 | Sect 5.3.2 | Tech-Minor | <p>It should be noted that 10 CFR 50.61a does not require that the licensee perform a probabilistic assessment as is being done for Doel. All that 10 CFR 50.61a requires (should a licensee decide to use it) is that the values of the reference temperature calculated as outlined in 10 CFR 50.61a should be less than certain critical values. In this manner the requirements of 10 CFR 50.61a are similar in format to those of 10 CFR 50.61.</p> <p>Of course there is nothing in 10 CFR 50.61a that prohibits a licensee from performing a probabilistic analysis.</p> |            |

| Type ID    | Definition                                                                                                                                                         |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Editorial  | Just something that was noticed. Provided for information.                                                                                                         |
| Info       | Additional explanation and/or information is suggested to clarify/improve the strength and/or logic of the safety case.                                            |
| Tech-Minor | <p>A technical comment having limited impact on the safety case.</p> <p>Address of this comment would improve the safety case, but is not viewed as necessary.</p> |
| Tech-Major | <p>A technical comment having significant impact on the safety case.</p> <p>Address of this comment is viewed as necessary.</p>                                    |
| Expansion  | A suggested expansion of the proposed argument that is viewed as augmenting the strength of the safety case.                                                       |

14-5

**Kirk, Mark**

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**From:** Kirk, Mark  
**Sent:** Tuesday, October 30, 2012 8:35 PM  
**To:** Stevens, Gary  
**Subject:** RE: Doel 3 Brief/Next Steps -- RESCHEDULED (again) DUE TO SANDY

"Normal" is a setting on a washing machine ... other than that it is pretty meaningless.

Just hassling you dude.

---

**From:** Stevens, Gary  
**Sent:** Tuesday, October 30, 2012 2:55 PM  
**To:** Kirk, Mark  
**Subject:** RE: Doel 3 Brief/Next Steps -- RESCHEDULED (again) DUE TO SANDY

This meeting needs to happen before Friday, and that is the only hour everyone can make it, including Stacey who I was told to include and must leave by 0900. Besides, the last time I checked, 0830 was AFTER the start of normal business hours.

Gary L. Stevens  
Senior Materials Engineer  
NRC/RES/DE/CIB  
E-mail: [Gary.Stevens@nrc.gov](mailto:Gary.Stevens@nrc.gov)<<mailto:Gary.Stevens@nrc.gov>>  
Office: 301-251-7569  
Blackberry: (b)(6)

-----Original Appointment-----

**From:** Kirk, Mark  
**Sent:** Tuesday, October 30, 2012 2:53 PM  
**To:** Stevens, Gary  
**Subject:** Accepted: Doel 3 Brief/Next Steps -- RESCHEDULED (again) DUE TO SANDY  
**When:** Thursday, November 01, 2012 8:30 AM-9:30 AM (GMT-05:00) Eastern Time (US & Canada).  
**Where:** HQ-OWFN-09B02-12p

i will try my best to be there by 0830 ... but just in case please call me on my cell (b)(6) so that i may listen into the insightful discussions.

0830 ... are you a crazy person?