

Enclosure 2 Contains Sensitive Proprietary Information

April 16, 2009

Mr. Jerald G. Head
Senior Vice President, Regulatory Affairs
GE Hitachi Nuclear Energy
3901 Castle Hayne Road MC A-50
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 309 RELATED TO
DESIGN CONTROL DOCUMENT (DCD) REVISION 5

Dear Mr. Head:

By letter dated August 24, 2005, GE Hitachi Nuclear Energy (GEH) submitted an application for final design approval and standard design certification of the economic simplified boiling water reactor (ESBWR) standard plant design pursuant to 10 CFR Part 52. The U.S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed design.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

Pursuant to 10 CFR 2.390, we have determined that the enclosed RAIs contain proprietary information. We have prepared a non-proprietary version of the RAIs (Enclosure 1) that does not contain proprietary information. The proprietary information is indicated in brackets and underlined in Enclosure 2. We will delay placing this document in the public document room for a period of ten (10) working days from the date of this letter to provide you with the opportunity to comment on the proprietary aspects only. If you believe that any additional information in the enclosure is proprietary, please identify such information line by line and define the basis pursuant to the criteria of 10 CFR 2.390 before the public release date.

Enclosure 2 Contains Sensitive Proprietary Information

J. Head

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If you have any questions or comments concerning this matter, you may contact me at 301-415-6256 or Dennis.Galvin@nrc.gov or you may contact Amy Cabbage at 301-415-2875 or Amy.Cabbage@nrc.gov.

Sincerely,

/RA/

Dennis Galvin, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-010

Enclosure:

1. Request for Additional Information (Non-Proprietary)
2. Request for Additional Information (Proprietary)

cc: See next page (w/o enclosure 2)

J. Head

- 2 -

If you have any questions or comments concerning this matter, you may contact me at 301-415-6256 or Dennis.Galvin@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or Amy.Cubbage@nrc.gov.

Sincerely,

/RA/

Dennis Galvin, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-010

- Enclosure: 1. Request for Additional Information (Non-Proprietary)
 2. Request for Additional Information (Proprietary)

cc: See next page (w/o enclosure 2)

Hard Copy

NGE1 R/F
DGalvin, NRO
ACubbage, NRO
JCruz, NRO

E-Mail:

RidsNroDnrlNge1
RidsAcrsAcnwMailCenter
RidsOgcMailCenter
RidsNroDcipColp
PPieringer NRO
MJunge NRO

ADAMS ACCESSION NO. ML091040441

NRO-010

OFFICE	PM:NGE1	LPM:NGE1
NAME	DGalvin	ACubbage
DATE	04/16/09	04/16/09

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**Requests for Additional Information (RAIs):
ESBWR Design Control Document (DCD) Revision 5 and NEDE-33374P, Revision 1**

RAI Number	Reviewer	Question Summary	Full Text
18.11-3 S03	Pieringer P	Operational Conditions Sampling: Sampling Dimensions	<p>In NEDE-33276P (Rev. 2), Section 4, GEH provides a discussion of their approach to operational condition sampling. Section 4.4.1.2 describes the minimum conditions and tasks to be included in at least one validation scenario. Section 4.4.1.3 describes the representative population of conditions and tasks to be addressed. Together these sections address the sampling dimensions in the NUREG-0711 review criteria. There are additional considerations identified that are appropriate, such as including each first-of-a-kind system. The level of detail provided is generally comparable to that in the Review criteria themselves. Thus the level of detail question still exists.</p> <p>Specific Methodology questions:</p> <ol style="list-style-type: none"> 1. With respect to the sampling of plant conditions, does the framework include failure events involving automation failures and human-system interface (HSI)? 2. With respect to the sampling of situational factors known to challenge human performance, the concept of "error forcing context" is identified, but not defined with respect to its application in the framework. How are error-forcing contexts defined? <p>Level of Detail:</p> <p>While GEH's revised plan and the answers to these questions will further clarify the methodology to be used for operational conditions sampling, it will not fully answer the staff's concern regarding level of detail. Identify the specific operational conditions that are identified through GEH's process.</p>
18.11-4 S03	Pieringer P	Operational Conditions Sampling: Scenario Identification	<p>NEDE-33276P (Rev. 2) does not identify the scenarios to be used as requested in the RAI. GEH provides a discussion of how scenarios are identified; however, the process is not clear.</p>

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			<p>Specific Methodology Questions:</p> <p>NEDE-33276P (Rev. 2), Section 4.4.2, includes scenario identification in its title, but the material in the section addresses developing the details of the scenario. Clarify how the considerations in Section 4.4.1.2 and Section 4.4.1.3 are used to identify the scenarios to be used in integrated system validation (ISV).</p> <p>Level of Detail:</p> <p>While GEH’s revised plan and the answers to these questions will further clarify the methodology to be used for scenario identification, it will not fully answer the staff’s concern regarding level of detail. Identify the scenarios to be used in support of integrated system validation.</p>
18.11-19 S03	Pieringer P	Validation Testbeds: Validation Simulator and Simulation of Remote Actions	<p>In the previous follow-up, the staff asked GEH to “identify what remote actions are needed for the scenarios to be used in validation testing and provide information as to how these actions will be modeled and evaluated for validation.” The request is for a specification of the precise actions that will be modeled in specific scenarios.</p> <p>Specific Methodology Questions:</p> <ol style="list-style-type: none"> 1. NEDE-33276P, Section 5.4.1.5, discusses the validation of “risk-important local control operations.” Section 5.4.3.7 discusses the use of “[].” How are these three types of tasks related? 2. The validation of “risk-important local control operations” is performed using simulations and mockups and verifies that the cues, indications, communications, and feedback built into the scenario guide are accurate and timely. Do the validations include []? 3. Will scenarios model other local tasks such as the opening of a local valve that might not be risk or safety important, but are important to scenario timing and fidelity?

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			<p>Level of Detail:</p> <p>While GEH's revised plan and the answers to these questions will further clarify the treatment of remote actions, it will not fully answer the staff's concern regarding level of detail. Identify the specific local actions to be modeled in each scenario in support of integrated system validation.</p>
18.11-22 S03	Pieringer P	Scenario Definition	<p>Since NEDE-33276P (Rev. 2) does not identify the scenarios to be used, detailed information about them, as requested in the RAI, cannot be provided at this time. In NEDE-33276P (Rev. 2), Section 4.4.2, GEH provides a discussion of their approach to scenario development and Section 5.4.3 discusses the scenarios definition process. These sections generally cover the topics addressed by the three review criteria in Section 11.4.3.2.4, Scenario Definition, with possible exceptions noted below. NEDE-33276P (Rev. 2) provides a reasonably clear picture of how scenarios will be constructed and what tools are provided to testing personnel to conduct the simulated scenarios. Reference is also made to a more detailed scenario development guide (procedure) that is used by test personnel to define the scenario. However, as noted above, no actual scenario details developed using the approach are provided.</p> <p>Specific Methodology Questions:</p> <ol style="list-style-type: none"> 1. Instructions for data collection were not completely addressed. Section 5.4.3.10 does discuss the administration of questionnaires; however, there is other data to collect that should be part of the scenario definition and instruction of test personnel, such as when scenarios are stopped for situation awareness assessment (as per page 59 of the plan). 2. Minor clarification on page 46, what is meant by "evaluation guide" in "Title of the <i>evaluation guide</i>?"

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			<p>Level of Detail:</p> <p>While GEH's revised plan and the answers to these questions will further clarify the methodology to be used for scenario definition, it will not fully answer the staff's concern regarding level of detail. Provide the scenario definitions to be used in support of integrated system validation.</p>
18.11-23 S02	Pieringer P	Performance Measurement: Measurement Characteristics	<p>In NEDE-33276P (Rev. 2), Section 5.4.4, GEH provides a description of the performance measures that will be used in validation testing. As part of the description, measurement characteristics are provided. In general, this information is acceptably based on a review using NUREG-0711 criteria. However, there are follow-up questions pertaining to the measures themselves (see the discussion for RAIs 18.11-24 below), thus the RAI must remain open until they are resolved. Provide the measurement characteristics for performance measures to be used in support of integrated system validation once the measure are defined per 18.11-24.</p>
18.11-24 S03	Pieringer P	<p>Performance Measurement: Performance Measurement Selection,</p> <p>Performance Measurement: Performance Criteria</p>	<p>Note that due to their close coupling, the evaluation below addresses both performance measures (RAI 18.11-24) and their associated criteria (RAI 18.11-26). While this RAI is designated as 18.11-24 S03, NRC will track 18.11-26 S01 as open pending the response to this supplement.</p> <p>In NEDE-33276P (Rev. 2), Section 5.4.4, GEH provides a description of the performance measures for plant/system level performance, operator task performance, crew communication/coordination, situation awareness, workload, and anthropometric/physiological factors that will be used in validation testing. The descriptions include the performance acceptance criteria to be used for each. Several follow-up questions regarding that material follow.</p> <p>Specific Methodology Questions:</p> <p>A. []</p>

RAI Number	Reviewer	Question Summary	Full Text
			<p><i>Performance Measurement Selection</i></p> <p>NEDE-33276P (Rev. 2), Section 5.4.4.1 identifies a [</p> <p style="text-align: right;">] Why is this measure only used for specific events/actions? [</p> <p style="text-align: right;">] If so, the approach proposed would fail to identify such an event. [</p> <p style="text-align: right;">] Technical specifications, safety limits (as per DCD, Tier 2, p. 2.0-1), limiting conditions of operation (LCOs) pertinent to each scenario, and critical safety function performance may provide a more complete and sensitive assessment of plant and system performance [</p> <p style="text-align: right;">] the other more sensitive limits could be used to identify human engineering discrepancies (HEDs) within an overall successful validation.</p> <p><i>Acceptance Criteria</i></p> <p>NEDE-33276P (Rev. 2), Section 5.4.4.1.2 states that the acceptance criteria for the measures as described is that scenarios [</p> <p style="text-align: right;">] As per the comment above, exceeding parameter values should be an acceptance criterion as well.</p>

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			<p>B. <u>Plant Human Reliability Analysis (HRA)/Probabilistic Risk Assessment (PRA) measurement</u></p> <p><i>Performance Measurement Selection</i></p> <p>In NEDE-33276P (Rev. 2), Section 5.4.4.2, GEH states that to test HRA/PRA assumptions, scenario events are selected that contain PRA risk significant tasks. [</p> <p style="text-align: right;">]. What are the “values” identified in the measure?</p> <p><i>Acceptance Criteria</i></p> <p>NEDE-33276P (Rev. 2), Section 5.4.4.2.2 indicates that the acceptability of performance is determined [</p> <p style="text-align: right;">] However, is this the correct category of measurement and acceptance criteria to validate the design?</p> <p>The successful accomplishment of risk-significant actions should be evaluated in ISV. Perhaps this is intended by the statement [</p> <p style="text-align: right;">] Clarify the evaluation of risk-significant actions in the ISV.</p> <p>C. <u>Personnel Tasks</u></p> <p><i>Performance Measurement Selection</i></p> <p>NEDE-33276P (Rev. 2), Section 5.4.4.3 states that for each integrated system validation scenario, the tasks that personnel perform during the scenario are identified. Tasks identified during scenario development are assessed during scenario performance to</p>

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			<p>validate that the integrated HSI adequately supports task performance. The MFN 08-672 Attachment 1 chart for Define and Document ISV Scenarios shows a step where [] are determined. NEDE-33276P (Rev. 2), Section 4.4.2.7 defines [] Characteristics of [] are defined, yet the PRA/HRA criteria are not mentioned. Are these tasks the same as those identified in the Plant HRA/PRA measurement section?</p> <p>[] Clarify the scope of performance measures.</p> <p>The NEDE further states that [] Clarify what is meant by this statement; []</p> <p>]</p> <p><i>Acceptance Criteria</i></p> <p>NEDE-33276P (Rev. 2), Section 5.4.4.3.2 indicates that the integrated system design is validated [] If tasks are also measured by time, error, frequency, etc., what are the specific criteria used for those evaluations?</p>

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			<p>Task measures also include many that are subjectively derived via observations by test personnel. How are acceptance criteria developed for these aspects of the task? []</p> <p>D. <u>Situation Awareness</u></p> <p><i>Performance Measurement Selection</i></p> <p>NEDE-33276P (Rev. 2), Section 5.4.4.5 addresses situation awareness measurement. [] In the selection of scenario freeze points, the NEDE indicates that the selection of freeze points during a significant event should be avoided because it disrupts the scenario. However, this would seem to be precisely the time one would want to assess situation awareness of the operations. Further, in the discussion of construct validity for this measurement technique, the NEDE states that the approach does not appear to significantly affect performance and research was cited indicating there was no effect due to freezing the simulation. Doesn't this suggest the concern is not warranted? It would seem that stop points could be selected during a significant event to minimize the disruption of ongoing operator actions as we believe is done []. Clarify the approach for situation awareness.</p> <p>GEH also proposes []. We are not sure this is an appropriate measure of situation awareness. Operators may have a good awareness of the plant state, but fail to take appropriate actions for a variety of reasons, e.g., they make an error or they do not know how to best respond. Conversely, operators may take correct actions without precisely knowing the current state of the plant. Clarify the measurement of situation awareness.</p>

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			<p><i>Acceptance Criteria</i></p> <p>NEDE-33276P (Rev. 2), Section 5.4.4.5.2 indicates that [</p> <p style="text-align: center;">] This does not provide a specific acceptance criterion. Clarify the acceptance criteria.</p> <p>E. <u>Physical Workload</u></p> <p><i>Acceptance Criteria</i></p> <p>NEDE-33276P (Rev. 2), Section 5.4.4.6.1.2 indicates that ‘Ergonomics rules established by the State of Washington Department of Labor and Industries provide the basis for determining acceptable workload.’ Provide a reference to these criteria.</p> <p>F. <u>Cognitive Workload</u></p> <p><i>Performance Measurement Selection</i></p> <p>NEDE-33276P (Rev. 2), Section 5.4.4.6.2 indicates [] will be used to assess cognitive workload. [] To determine when [] will be assessed, a task screening methodology will be used. “Tasks known to be free from time pressure, complicated evolutions, and/or considered failsafe, along with other predetermined parameters are screened and eliminated from cognitive workload assessment.” While we certainly understand the desire to measure workload of suspected “high-workload tasks,” another concern in highly automated plants is underload. Note that the acceptance criteria acknowledge the unacceptability of low workload (see RAI 18.11-26). How does the methodology proposed, identify periods of underload?</p>

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			<p>To obtain a workload assessment, [</p> <p style="padding-left: 40px;">] Will the scenario be stopped? If not, there may be a delay before operators respond, so their ratings will reflect the current workload, not necessarily that associated with the target task. Clarify the workload assessment of selected tasks.</p> <p>[</p> <p style="padding-left: 40px;">] Is this done in real time as the scenario is unfolding? Approximately how much time will be required to obtain all the [</p> <p style="padding-left: 40px;">]</p> <p><i>Acceptance Criteria</i></p> <p>NEDE-33276P (Rev. 2), Section 5.4.4.6.2.2 indicates that [</p> <p style="padding-left: 40px;">] Describe how the zones will be defined?</p> <p>Level of Detail:</p> <p>While GEH's revised plan and the answers to these questions will further clarify the methodology to be used for performance measurement selection and the criteria to be used to evaluate integrated system performance, it will not fully answer the staff's concern regarding level of detail. Provide:</p> <ul style="list-style-type: none"> • the specific performance measures, scenario specific where appropriate, to be used in support of integrated system validation • the specific criteria that will be used to evaluate the acceptability of the integrated system

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18.11-27 S03	Pieringer P	Test Design	<p>NEDE-33276P (Rev. 2), Section 5.4.5 provides information on test design. The plan's treatment of participant training and pilot testing acceptably addressed the staff's review criteria. Follow-up questions on the aspects of test design are considered separately below.</p> <p>Specific Methodology Questions:</p> <ol style="list-style-type: none"> 1. Section 5.4.5.1 addresses the <i>presentation of scenarios to crews</i>. With respect to scenario assignment, GEH indicates that scenarios should be carefully balanced across crews to ensure each crew receives a representative range of scenarios. This will be accomplished using a checklist; however, the specific way in which balance is achieved is not discussed. Describe the method(s) used to balance scenarios across crews. With respect to scenario sequencing, GEH indicates that the order in which scenarios are presented to crews should be balanced. However, the specific way in which balanced sequencing is achieved is not discussed. Describe the method(s) used to balance scenarios sequences for individual crews. 2. With regard to minimizing bias, GEH plans to use well-developed procedures including scripted responses which should serve to minimize bias. As part of crew briefing, crews will be asked to refrain from discussing the scenarios with other crews, which should also help minimize bias. Also, the introduction of tester bias is discussed as part of test personnel training. While all these features of the test program should minimize bias, a final determination cannot be made until the specific details of the procedures are available. For example, Section 5.4.5.2, Item 2 indicates that test objectives are part of the crew briefing. Since little additional information is provided about what this is, it is possible that communicating detailed scenario objectives could give information to the crew about what is going to happen and this will bias their responses. Clarify this aspect of the crew briefing. <p>Level of Detail:</p> <p>In summary, GEH has provided a description of their approach to test procedures.</p>

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			<p>However, it is difficult to evaluate precisely how the procedures will work in the absence of specific details about the scenarios or a concrete example to illustrate their application.</p> <p>While GEH's revised plan and the answers to these questions will further clarify the test design, it will not fully answer the staff's concern regarding level of detail. Identify the specific test design details to be used in support of integrated system validation.</p>
18.5-5 Supplement 5 (MFN 09-087, February 10, 2009)	Pieringer P	Clarify processes in the task analysis implementation plan and the associated work instruction.	<p>In MFN 09-087, GEH provided considerable detailed information about their task analysis (TA) methodology in response to RAI 18.5-5 S04. The RAI response presented excerpts from the TA work instruction (WI) that provided the detailed methodology. However, several issues need clarification.</p> <ol style="list-style-type: none"> 1. Clarify implementation plan (IP) and WI inconsistency. <p>Clarify the following inconsistency between the IP and WP. IP Section 4.1.2 lists "system configurations from the SFRA [System Functional Requirements Analysis]" and "SFRA function flow data structure" as inputs to the Task Analysis, while the WI Section 7.1 does not address either of these sources of information. The WI does list "OER [Operating Experience Review]/BRR [Baseline Review Record]" which is not mentioned in the IP.</p> <ol style="list-style-type: none"> 2. Explain the repeated use of TA's <p>The flow of task analysis activities is hard to follow. This is in part due to the reuse of the same aspects of the work instruction. For example, to address "Task Identification," TA-1 requires the analyst to address task characteristics such as the parameters that indicate that an activity has been accomplished (see page 3 of the MFN enclosure). Yet a couple of pages later, TA-1 is again used under "Parameters" and the very same aspects of the task are addressed (see page 7 of the MFN enclosure). What is the difference between the two? In fact TA-1 is identified approximately seven times in the MFN, often apparently seeking the same information.</p> <p>TA-1 is just an example. Please explain the reuse of the same TA's multiple times, seemingly repeating the same activities.</p>

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			<p>3. Explain/correct inconsistent Linking of WI steps to IP bullets</p> <p>There are places where the WI steps provided do not seem well connected to the IP bullet they are meant to expand on. For example, on page 19 of the MFN Enclosure, WI steps are provided for assessing operator vigilance. Yet the WI steps do not seem to address vigilance at all and instead address response requirements (TA-16). One aspect of what is addressed is the force to be applied by a person conducting a task. This does not seem to be related to vigilance, but does seem to be related to a different aspect of task analysis listed on page 21 – “physical workload.” But force is not mentioned there.</p> <p>A second example is on page 24 of the MFN Enclosure, where WI steps are provided for addressing work allocation. The WI steps provide instructions for workload screening and do not specifically relate to work allocation.</p> <p>Explain or correct the links between WI and IP.</p> <p>4. Clarify the meaning of interdependency.</p> <p>It is not clear how the concept of interdependency is used in the TA process. Interdependency usually refers to aspects of one task that are needed by or shared with another task. The WI steps listed for interdependency appear to address the various requirements for task performance, such as control requirements, response requirements, indication requirements, etc. The use of interdependency needs to be clarified.</p> <p>5. Incorporate applicable information into the implementation plan.</p> <p>Note that since this RAI requests direction on how work will be done, then that information needs to be included in the DCD (or a document incorporated by reference). Therefore, the staff requests that GEH incorporate the information contained in</p>

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			MFN 09-087 as augmented or modified by this supplement into an appropriate source document. One acceptable way to accomplish this expeditiously is to incorporate the information as an appendix in the Task Analysis implementation plan.

DC GE - ESBWR Mailing List
cc:

(Revised 04/01/2009)

Ms. Michele Boyd
Legislative Director
Energy Program
Public Citizens Critical Mass Energy
and Environmental Program
215 Pennsylvania Avenue, SE
Washington, DC 20003

Mr. Tom Sliva
7207 IBM Drive
Charlotte, NC 28262

DC GE - ESBWR Mailing List

Email

aec@nrc.gov (Amy Cubbage)
APH@NEI.org (Adrian Heymer)
art.alford@ge.com (Art Alford)
awc@nei.org (Anne W. Cottingham)
bevans@enercon.com (Bob Evans)
BrinkmCB@westinghouse.com (Charles Brinkman)
cberger@energetics.com (Carl Berger)
charles.bagnal@ge.com
charles@blackburncarter.com (Charles Irvine)
chris.maslak@ge.com (Chris Maslak)
CumminWE@Westinghouse.com (Edward W. Cummins)
cwaltman@roe.com (C. Waltman)
dan1.williamson@ge.com (Dan Williamson)
Daniel.Chalk@nuclear.energy.gov (Daniel Chalk)
david.hinds@ge.com (David Hinds)
david.lewis@pillsburylaw.com (David Lewis)
David.piepmeyer@ge.com (David Piepmeyer)
donaldf.taylor@ge.com (Don Taylor)
erg-xl@cox.net (Eddie R. Grant)
Frostie.white@ge.com (Frostie White)
gcesare@enercon.com (Guy Cesare)
GEH-NRC@hse.gsi.gov.uk (Geoff Grint)
george.honma@ge.com (George Honma)
GovePA@BV.com (Patrick Gove)
greshaja@westinghouse.com (James Gresham)
gzinke@entergy.com (George Alan Zinke)
hickste@earthlink.net (Thomas Hicks)
hugh.upton@ge.com (Hugh Upton)
james.beard@gene.ge.com (James Beard)
james.gleason@ge.com (James Gleason)
jeff.waal@ge.com (Jeff Waal)
jerald.head@ge.com (Jerald G. Head)
Jerold.Marks@ge.com (Jerold Marks)
jgutierrez@morganlewis.com (Jay M. Gutierrez)
Jim.Kinsey@inl.gov (James Kinsey)
jim.riccio@wdc.greenpeace.org (James Riccio)
JJNesrsta@cpsenergy.com (James J. Nesrsta)
joel.Friday@ge.com (Joel Friday)
John.O'Neill@pillsburylaw.com (John O'Neill)
john.sorensen@ge.com (John Sorensen)
Joseph_Hegner@dom.com (Joseph Hegner)
junichi_uchiyama@mnes-us.com (Junichi Uchiyama)
kimberly.milchuck@ge.com (Kimberly Milchuck)
KSutton@morganlewis.com (Kathryn M. Sutton)

DC GE - ESBWR Mailing List

kwaugh@impact-net.org (Kenneth O. Waugh)
lchandler@morganlewis.com (Lawrence J. Chandler)
lee.dougherty@ge.com
lou.lanese@ge.com (Lou Lanese)
Marc.Brooks@dhs.gov (Marc Brooks)
maria.webb@pillsburylaw.com (Maria Webb)
mark.beaumont@wsms.com (Mark Beaumont)
Marvin.Smith@dom.com (Marvin L. Smith)
matias.travieso-diaz@pillsburylaw.com (Matias Travieso-Diaz)
media@nei.org (Scott Peterson)
mike_moran@fpl.com (Mike Moran)
MSF@nei.org (Marvin Fertel)
mwetterhahn@winston.com (M. Wetterhahn)
nirsnet@nirs.org (Michael Mariotte)
PAC2@nrc.gov (Peter Cochran)
pareez.golub@ge.com (Pareez Golub)
patriciaL.campbell@ge.com (Patricia L. Campbell)
paul.gaukler@pillsburylaw.com (Paul Gaukler)
Paul@beyondnuclear.org (Paul Gunter)
peter.yandow@ge.com (Peter Yandow)
pshastings@duke-energy.com (Peter Hastings)
rick.kingston@ge.com (Rick Kingston)
RJB@NEI.org (Russell Bell)
RKTemple@cpsenergy.com (R.K. Temple)
Russell.Wells@ARev.a.com (Russell Wells)
sabinski@suddenlink.net (Steve A. Bennett)
sandra.sloan@aRev.a.com (Sandra Sloan)
sara.andersen@ge.com (Sara Anderson)
SauerB@BV.com (Robert C. Sauer)
sfrantz@morganlewis.com (Stephen P. Frantz)
stephan.moen@ge.com (Stephan Moen)
steven.hucik@ge.com (Steven Hucik)
tdurkin@energetics.com (Tim Durkin)
timothy1.enfinger@ge.com (Tim Enfinger)
tom.miller@hq.doe.gov (Tom Miller)
trsmith@winston.com (Tyson Smith)
Vanessa.quinn@dhs.gov (Vanessa Quinn)
VictorB@bv.com (Bill Victor)
Wanda.K.Marshall@dom.com (Wanda K. Marshall)
wayne.cutright@ge.com (Wayne Cutright)
wayne.marquino@ge.com (Wayne Marquino)
whorin@winston.com (W. Horin)