Proprietary – Withhold under 10 CFR 2.390. Enclosure 1 contains PROPRIETARY information.

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GO2-17-050

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397 RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION, COLUMBIA MUR LAR: EICB AND SRXB**

References:

1. Letter GO2-16-096 from A. L. Javorik (Energy Northwest) to NRC: "License Amendment Request to Revise Operating License and Technical Specifications for Measurement Uncertainty Recapture (MUR) Power Uprate," dated June 28, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16183A365)
2. Letter GO2-16-124 from A. L. Javorik (Energy Northwest) to NRC: "Response to License Amendment Request - Opportunity to Supplement," dated August 18, 2016 (ADAMS ML16231A511)
3. Letter GO2-17-015 from A. L. Javorik (Energy Northwest) to NRC: "Response to Request for Additional Information, Columbia MUR LAR: Electrical Instrument and Controls Branch (EICB) and Reactor Systems Branch (SRXB) (CAC No. MF8060)," dated January 12, 2017
4. E-mail from J. Klos (NRC) to R. M. Garcia (Energy Northwest): "CGS Docket 50-397 Response to Request for Additional Information, Columbia MUR LAR: EICB and SRXB," dated January 19, 2017
5. E-mail from J. Klos (NRC) to R. M. Garcia (Energy Northwest): "NRC Staff Comments on Columbia MUR RAI-EICB-01 – Columbia Instrumentation Response," dated January 25, 2017

Dear Sir or Madam:

By Reference 1, Energy Northwest submitted a license amendment for Columbia Generating Station (Columbia) to recapture certain measurement uncertainties as a power uprate.

When Enclosure 1 is removed from this letter, the letter and remaining document is NON-PROPRIETARY.

By Reference 2, Energy Northwest supplemented the original request. By Reference 3 Columbia provided its response to a request for additional information and in References 4 and 5, the US Nuclear Regulatory Commission (NRC) staff provided comments and editorials against the Columbia responses and requested Columbia provide gap information not found in the RAI responses. The enclosures provide the gap information and responses to the comments and editorials provided in References 4 and 5.

Enclosure 1 to this letter contains proprietary information as defined by 10 CFR 2.390. GE-Hitachi Nuclear Energy Americas LLC (GEH), as the owner of the proprietary information, has executed the affidavit attached to this letter, which identifies that the enclosed proprietary information has been handled and classified as proprietary, is customarily held in confidence, and has been withheld from public disclosure. The proprietary information was provided to Energy Northwest in a GEH transmittal that is referenced by the affidavit. The proprietary information has been faithfully reproduced in the enclosed such that the affidavit remains applicable. GEH requests that the enclosed proprietary information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. A non-proprietary version is provided in Enclosure 2.

The No Significant Hazards Consideration Determination (NSHCD) provided in the original submittal is not altered by this submittal. This letter contains no regulatory commitments.

If you have any questions or require additional information, please contact Mr. R. M. Garcia at (509) 377-8463.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 21ST day of February 2017.

Respectfully,

A. L. Javorik
Vice President, Engineering

Attachment: As stated
Enclosures: As stated

cc: NRC RIV Regional Administrator
NRC NRR Project Manager
NRC Senior Resident Inspector/988C
CD Sonoda – BPA/1399 (email) w/o enclosure(s)
WA Horin – Winston & Strawn w/o enclosure(s)
RR Cowley -WDOH (email) w/o enclosure(s)
EFSECutc.wa.gov-- EFSEC (email) w/o enclosure(s)

Affidavit for Withholding

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, Lisa K. Schichlein, state as follows:

(1) I am a Senior Project Manager, NPP/Services Licensing, Regulatory Affairs, GE-Hitachi Nuclear Energy Americas LLC (GEH), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 1 of GEH letter, DOC-0001-1115-125, "Supplemental Information for CGS MUR RAI-EICB-01," dated February 14, 2017. The GEH proprietary information in Enclosure 1, which is entitled "Supplemental Information for RAI-EICB-01 in Support of the CGS MUR LAR," is identified by a dotted underline inside double square brackets. [[This sentence is an example.{3}]] GEH proprietary information in figures and large objects is identified with double square brackets before and after the object. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the *Freedom of Information Act* ("FOIA"), 5 U.S.C. Sec. 552(b)(4), and the *Trade Secrets Act*, 18 U.S.C. Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for trade secrets (Exemption 4). The material for which exemption from disclosure is here sought also qualifies under the narrower definition of trade secret, within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975 F.2d 871 (D.C. Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F.2d 1280 (D.C. Cir. 1983).

(4) The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. Some examples of categories of information that fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;

b. Information that, if used by a competitor, would reduce their expenditure of resources or improve their competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information that reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

d. Information that discloses trade secret or potentially patentable subject matter for which it may be desirable to obtain patent protection.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, not been disclosed publicly, and not been made available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary or confidentiality agreements that provide for maintaining the information in confidence. The initial designation of this information as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in the following paragraphs (6) and (7).

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, who is the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or who is the person most likely to be subject to the terms under which it was licensed to GEH.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary or confidentiality agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains the detailed GEH methodology for thermal power optimization for GEH Boiling Water Reactors (BWRs). Development of these methods, techniques, and information and their application for the design, modification, and analyses methodologies and processes was achieved at a significant cost to GEH.

The development of the evaluation processes along with the interpretation and application of the analytical results is derived from the extensive experience and information databases that constitute a major GEH asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH. The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to

quantify, but it clearly is substantial. GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 14th day of February 2017.

Lisa K. Schichlein
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Regulatory Affairs
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NON-PROPRIETARY VERSION OF RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION: COLUMBIA MUR

This enclosure contains Energy Northwest's responses to the gap information requested by the NRC staff in its comments and editorials against the Columbia MUR SRBX RAIs responses.

1. For RAI-SRXB-2 response, it stated that [Technical Specification] TS 3.4.12 will limit the dome pressure to be ≤ 1035 psig. However, the dome pressure for [thermal power optimization] TPO [reactor thermal power] RTP as listed in [Technical Safety Analysis Report] TSAR Table 1-2 is 1020 psig (i.e. 1035 psia). The dome pressure of 1020 psig is used as the input data for many safety analyses (e.g. UFSAR Table 15.0-2). The response does not answer how the dome pressure of 1020 psig be assured, in order to be consistent with the safety analysis assumption, especially when the pressure regulator is out of service. During pressure regulator out of service, how or what the turbine control valve openings are set for the [measurement uncertainty recapture] MUR RTP steam flow for MUR RTP operation? Note that the MUR is based on an assumption of constant dome pressure.

   Energy Northwest's Response to Item 1

   The statement above is correct. The TS does state the vessel dome pressure is ≤ 1035 psig.

   The Digital Electro-Hydraulic (DEH) control system provides main turbine control (governor) valve and bypass valve position demands so as to maintain a nearly constant reactor pressure during normal plant operation. To accomplish this, the DEH control system selects from three redundant pressure transmitters to control steam pressure. A median selector is used by the DEH control system to determine which throttle pressure transmitter is controlling. In addition, if one throttle pressure transmitter fails, the DEH control system will automatically select the higher value of the two remaining transmitters for control. Pressure Regulator Out of Service (PROOS) occurs when two of the three DEH pressure controllers have failed.

   The DEH pressure controller turbine throttle pressure is set so that reactor dome pressure is 1020 psig at full power, providing margin to the Technical Specification limit of ≤ 1035 psig. During PROOS operation, the single remaining pressure controller maintains dome pressure at 1020 psig at full power.

   With the application of MUR, the turbine throttle pressure setpoint is adjusted to compensate for the change in main steam line pressure drop, due to increased steam flow at MUR rated power. The DEH pressure controllers then maintain dome pressure at 1020 psig at MUR full power, with no reduction in margin to the TS limit of ≤ 1035 psig.

2. For RAI-SRXB-3 response, it is noted that the [feedwater temperature reduction] FWTR can only be applied when the cycle exposure reaches to [end of rated] EOR. It is known that a 100% reactor power will not be able to be maintained after EOR.

Hence, it will not be required to have a full and standard service of feedwater heaters. However, it is not clear if the [feedwater out-of-service] FWOOS is required similarly to operate after EOR. The [request for additional information] RAI response does not answer the question explicitly for FWOOS. In the [Thermal Power Optimization Licensing Topical Report] TLTR (NEDC-32938) Appendix C, the third paragraph described that the TPO (i.e. MUR) rated thermal power level would be calculated using the full, standard configuration of FW heaters in service, nominal (unchanged) dome operating pressure and rated core flow. In Sec. 5.2 Power/Flow Map of TLTR, it stated in the last paragraph that, some plants will augment the power level by reducing the FW temperature. If previously licensed to reduce the feedwater temperature and plan to keep FWOOS operation option for MUR, the TSAR (NEDC-33853) or licensee should provide a plant evaluation for the impact of reducing feedwater temperature on the plant (e.g. feedwater sparger" at MUR condition. What is the maximum core power level was assumed for the plant evaluation for previously licensed FWOOS?

Energy Northwest's Response to Item 2

As stated in letter GO2-17-015, dated January 12, 2017, feedwater temperature reduction (FWTR) operation was approved in Amendment 77. As shown in Sections 1.3.2, 1.4, and 1.5 of Enclosure 7 of the original submittal, equipment out-of-service (OOS) features that are currently licensed at Columbia and evaluated as part of the MUR submittal included FWTR and feedwater heater out of service (FWHOOS) evaluations were performed at a TPO uprate of 101.66% of the currently licensed power level which bounds the requested MUR uprated power of 3544 MWt as shown in the table on page 3 of the enclosure to letter GO2-17-015.

3. For RAI-SRXB-11 response, the words "feedwater" and "FW" in the sentences of "Because feedwater flow is relatively cooler ...." and "For TPO there is relatively more cool FW ..." should be changed to "core flow".

Energy Northwest's Response to Item 3

Energy Northwest is revising the last sentence of its response to RAI-SRXB-11 to state; For TPO, the net result is a reduction in core inlet enthalpy and therefore a reduction in the recirculation loop and RWCU enthalpies. Therefore, the words "feedwater" and "FW" should not be changed to "core flow."

The NRC staff has comments to Energy Northwest's response to RAI-EICB-1 for the Columbia MUR. While the response included a summary of the calculation methodology and the error inputs to the calculation, some information was absent which thereby limits the ability of the NRC staff to complete the regulatory and technical review.

In order to bridge this gap, it is proposed that Energy Northwest either

a) provide the calculation, including the setpoint calculation spreadsheets, on the docket or

b) more timely and directly, provide the following gap information that was not found in the RAI response -- via an additional supplemental letter responding to the instrumentation RAI -- of

1. Description of any changes in assumptions for the calculation, including the bases for changed assumptions.
2. Provide a summary calculation that shows how the errors are combined to calculate the value of the total loop uncertainty (total loop error) including the actual value for total loop uncertainty.
3. Provide the value of as-found tolerance and how errors outside the acceptable range are handled.

Energy Northwest Response to b)1:

Changes in Assumptions for the Calculations, including the Bases for Changed Assumptions:

There were no changes to the assumptions made in the source setpoint calculation of record from Columbia (Reference 1-8) in the GE-Hitachi Nuclear Energy Americas LLC (GEH) setpoint calculations, and no additional assumptions were made in the GEH setpoint calculations.

There were changes in methodology:

a) For the Analytical Limit (AL) for the Main Steam Line (MSL) High Flow Isolation of 140%, in terms of differential pressure (psid), the electronic copy of GEH Services Information Letter (SIL) 438 (Reference 1-3) summarized the changes in the Introduction section. Also, the response to EICB-RAI-1 provided a summary of the changes in methodology, including an adjustment to the isentropic coefficient (ratio of specific heats at constant pressure and constant volume; also known as the isentropic exponent) of steam to more realistically approximate the moist steam flowing through the MSLs and the venturi in each MSL. This methodology also includes consideration of the pressure drop between the Reactor Pressure Vessel (RPV) steam dome and the entrance of the venturi.

In more detail, there are assumption differences (i.e., differences in the way GEH calculates input parameters) between SIL 438 Revision 1 and SIL 438 Revision 2[1], that affect how the differential pressures were calculated, namely:

B = Beta ratio of throat to pipe inside diameter now takes into account the area thermal expansion factor (ratio) differences between stainless steel and carbon steel.

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[1] Note that SIL 438 was later revised to Revision 3 (Reference 1-3; previously submitted), but there were no changes in the methodology.

ρ = the upstream fluid density changes from a dry saturated steam condition at dome pressure to the upstream fluid density for the static pressure at entrance to the flow limiter, taking into account pipe losses from the dome to the flow limiter entrance, and assuming the initial moisture content in the RPV steam dome is 0.1%.

k = ratio of specific heat changes from 1.255 to 1.080, which more accurately represents the steam/water mixture in the BWR operating range of interest (i.e., 900 psia to 1,100 psia).

b) For the calculation of the Allowable Value (AV) and Nominal Trip Setpoint (NTSP), the Process Measurement Accuracy (PMA) instrument error was changed from a random error of ±1 % Calibrated Span (SP) to a [[ ]] error. This increased the uncertainty from ±1.65 psid to 4.23 psid.

   The PMA error is a [[ ]] error calculated by subtracting the venturi dPr corresponding to AL flow at a RPV steam dome pressure which is 15 psi higher than rated from the venturi dPr value corresponding to the same AL flow at rated steam dome pressure.

c) For the calculation of the AV and NTSP, the primary element accuracy (PEA) instrument error changed from ±2% rated flow to ±0.75% of Point (PoP). Meaning the PEA changed from approx. ±1.2678 psid to ±3.02 psid. The starting "Point" used is the differential pressure at the AL.

   The PEA error would be the random error in psid due to the flow changing by the error around the AL. Thus, the PEA is the difference from the flow dPr at the AL and the flow dPr at the AL changed by 0.75% rated flow.

Energy Northwest Response to b)2:

Summary Calculation and Value of the Total Loop Uncertainty (Total Loop Error)

The errors were combined using the methodology explained in the original RAI response. The listing of error terms used is shown below in the Specified Value/Equation column for the Differential Pressure Indicating Switch (DPIS), all from Reference 1-7 (previously submitted). The number used in the calculation is also identified.

Parameter	Specified Value/Equation	Number Used in Calculation	[[ ]]
PEA	± 0.75% of point	± 3.02 psid	[[ ]]
PMA	4.23 psid [[ ]]	4.23 psid [[ ]]	n/a
DPIS Full Scale (FS)	-15 psid to +150 psid	165 psid	n/a
DPIS Accuracy (VA)	± 0.25% Full Scale	± 0.4125 psid	[[ ]]
DPIS Temperature Effect (TE)	No additional error when operated from -40 – +180 degF	zero	[[ ]]
DPIS Seismic Effect (SE)	0% CS (CS = SP = Calibrated Span)	zero	[[ ]]
DPIS Radiation Effect (RE)	0% CS	zero	[[ ]]
DPIS Humidity Effect (HE)	0% CS	zero	[[ ]]
DPIS Power Supply Effect (PSE)	not applicable (n/a)	zero	[[ ]]
DPIS RFI/EMI effect[2]	n/a	zero	[[ ]]
DPIS Insulation Resistance Effect (IRE)	n/a	(not used)	n/a
DPIS Overpressure Effect (OPE)	n/a	zero	[[ ]]
DPIS Static Pressure Effect (SPE)	± 0.25 %FS / 1,000 psi over range pressure = approx. ± 0.258 %FS	± 0.425861 psid	[[ ]]
DPIS Drift (VD)	± 1 % SP / 18 months ± 1.118034 % SP / 22.5 months	± 1.844756 psid	[[ ]]
DPIS As-Left Tolerance (ALT)	± 2 % FS	± 3.3 psid	[[ ]]
DPIS Leave Alone Tolerance (LAT)	= ALT	± 3.3 psid	[[ ]]
Heise® Pressure Gauge Model CMM 750	0 psid to 750 psid	750 psid	

[2] RFI/EMI = Radio Frequency Interference/ Electromagnetic Interference.

Parameter	Specified Value/Equation	Number Used in Calculation	[[ ]]
Full Scale			
Heise® Pressure Gauge Model CMM 750 total Accuracy (C_{TOOL})	± 0.1 % FS	± 0.75 psid	[[ ]]
Heise® Pressure Gauge Model CMM 750 minor division	1 psid	± 0.5 psid = C_{READ}	[[ ]]
Assumed Calibration Standard Accuracy (C_{STND})	Assumed equal to $^1/_4$ Calibration Tool Accuracy[3]	± 0.1875 psid	[[ ]]

Combining the Errors:

Analytical Limit = 140% rated Main Steam Line flow
= 145.37 psid

DPIS Accuracy = $\{ (VA)^2 + (SPE)^2 \}^{1/2}$

Calibration Accuracy = [[ ]]

Allowable Value = $AL - AV_{MARGIN}$

AV_{MARGIN} = [[ ]] = **7.382295 psid**

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[3] Not a change in assumptions made.

AV^4	= $AL - AV_{MARGIN}$		
	= 145.37 - 7.382295		= **137.9 psid**
Nominal Trip Setpoint 1	= $AL - NTSP_{MARGIN}$		
Limiting Trip Setpoint	= NTSP1		
$NTSP_{MARGIN}$	= [[	]]	
$NTSP_{MARGIN}$	= Total Loop Uncertainty (Total Loop Error) for NTSP1		= **7.728457 psid**
NTSP1	= LTSP = $AL - NTSP_{MARGIN}$		
	= 145.37 - 7.728457		= 137.6 psid

Then, as indicated in Figure 1-1 in Reference 1-9, further adjustments are made to obtain NTSP2 and the final adjusted NTSP using GEH instrument setpoint methodology. NTSP(Adj) = $NTSP_F$ = Final NTSP with required margin to AV.

NTSP(Adj) = $NTSP_F$ = **134.6 psid**

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[4] The numbers for AV and the NTSPs (including LTSP) exclude head correction.

As stated in Reference 1-9:

> The following Table 1-1 provides a comparison of the calculated results in units of differential pressure (psid) for the CGS setpoint calculation for TPO conditions, per GEH instrument setpoint methodology. Note, as stated earlier, the final adjusted $NTSP_F$ is further away from the AL than NTSP1, the Limiting Trip Setpoint (LTSP). Also, note that the intermediate NTSP(s) are not included.

Table 1-1

Parameter	TPO psid
AL	145.37
AV	137.9
NTSP1 (LTSP)	137.6
$NTSP_F$	134.6

Energy Northwest Response to b)3:

Value of "As-Found" Tolerance and how Errors Outside the Acceptable Range are Handled

Energy Northwest's procedure for the performance of the channel calibration to verify that the turbine throttle valve (TTV)-Closure, and turbine governor valve (TGV) fast closure for reactor protection system (RPS) and end of cycle recirculation pump trip (EOC-RPT) are not bypassed when thermal power is ≥ 30% rated thermal power (RTP) contains a tolerance band of 136.3 psig to 148.3psig and a set point of 142.3 psig.

Procedurally, the as found conditions are documented within the calibration procedure. After documenting the as found condition, the procedure provides appropriate guidance to re-calibrate the instrument. If recalibration is unsuccessful (i.e., not repeatable) the condition is entered into the corrective action program (CAP), a work request (WR) in initiated and both the CAP document and WR numbers are recorded on the procedure cover sheet and reviewed by operations. The WR drives the replacement of the instrument. The CAP documentation process ensures all required reviews and notifications are completed in a timely manner.

REFERENCES

1-3 GE Hitachi Nuclear Energy Services Information Letter (SIL) 438, "Main Steam Line High Flow Trip Setting," Revision 2, May 10, 2013 (and later updated without methodology change to Revision 3, July 28, 2016).

1-7 GE Hitachi Nuclear Energy, "Instrument Limits Calculation Energy Northwest Columbia Generating Station Main Steam Line High Flow Group 1 Isolation," 000N7333-R2-Col-TPO-MslHiFlo-Calc, Revision 1, March 2016.

1-8 Washington Public Power Supply System, Calculation E/I-02-92-1063, "Setting range determination for instrument loop MS-DPIS-8A," Revision 0, December 29, 1993.

1-9 Letter, Larry King (GEH) to James Brownell (Energy Northwest), "GEH Responses to CGS MUR RAIs EICB-RAI-1 and RAI-SRXB-4, 6, 8, 10, and 13," DOC-0001-1115-123, December 7, 2016.