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2CAN041801

April 30, 2018

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Notification of Revised License Renewal Commitments
Arkansas Nuclear One – Unit 2
Docket No. 50-368
License No. NPF-6

REFERENCE: NRC letter to Entergy, *Issuance of Renewed Facility Operating License, No. NPF-6*, dated June 30, 2005 (2CNA060503) (ML051800757)

Dear Sir or Madam:

The purpose of this letter is to inform the NRC that Entergy Operations, Inc. is revising commitments related to the above reference for Arkansas Nuclear One, Unit 2 (ANO-2). The revised commitments and justifications/clarifications are provided in Attachment 1.

This letter contains revised regulatory commitments, which are identified in Attachment 2. Should you have any questions concerning this submittal, please contact me.

Sincerely,

ORIGINAL SIGNED BY STEPHENIE L. PYLE

SLP/nbm

Attachments: 1. ANO-2 Revised License Renewal Commitments
2. List of Regulatory Commitments

cc: Mr. Kriss Kennedy
Regional Administrator
U. S. Nuclear Regulatory Commission, Region IV
1600 East Lamar Boulevard
Arlington, TX 76011-4511

NRC Senior Resident Inspector
Arkansas Nuclear One
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U. S. Nuclear Regulatory Commission
Attn: Mr. Thomas Wengert
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Attachment 1 to

2CAN041801

Arkansas Nuclear One, Unit 2 (ANO-2) Revised License Renewal Commitments

Arkansas Nuclear One, Unit 2 (ANO-2) Revised License Renewal Commitments

Commitment 17927 – Reactor Vessel Head Penetration Program (ANO-2 License Renewal Application (LRA), 2CAN100302, dated October 14, 2003, Appendix B, Section B.1.20) outlines requirements consistent with NRC Order EA-03-009, Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors. This commitment is being deleted.

Justification: The ANO-2 Reactor Vessel Head Penetration Program was based on NRC Order EA-03-009. Since program inception, the NRC has promulgated 10 CFR 50.55a, introducing a rule that all pressurized water reactor (PWR) licensees include the requirements of American Society of Mechanical Engineers (ASME) Code Case N 729-4, *Alternative Examination Requirements for PWR)Vessel Upper Heads with Nozzles Having Pressure-Retaining Partial-Penetration Welds*, in the Inservice Inspection (ISI) Program. Entergy Operations, Inc. (Entergy) has augmented the ISI program with N-729-1 requirements as required by 10 CFR 50.55a(g)(6)(ii)(D)(1) through (4), thereby superseding the requirements of EA-03-009. Consequently, since the inspections required by the Reactor Vessel Head Penetration Program have been superseded by 10 CFR 50.55a, the specific commitment as outlined in the LRA is no longer necessary, and therefore, this commitment is being deleted.

Commitment 17925 – The Periodic Surveillance and Preventive Maintenance (PSPM) Program (ANO-2 LRA, 2CAN100302, dated October 14, 2003, Appendix B, Section B.1.18) was modified per letter 2CAN100403, Annual Update to the LRA, dated October 13, 2004. This commitment is being clarified. Specifically, the following section was added regarding low-pressure safety injection (LPSI) and high-pressure safety injection (HPSI) Pump Surveillance Testing and Inspection.

> LPSI and HPSI pump surveillance testing manages fouling on the borated water side of heat exchanger tubing of LPSI and HPSI pump seal coolers and fouling and loss of material on the raw water side of HPSI pump bearing housing internal surface and the lube oil cooling tube.
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> Enhancement: For HPSI pumps 2P-89A and 2P-89B, the raw water side of the bearing housing will be inspected for loss of material (including that due to selective leaching). For HPSI pump 2P89C, the internal surface of the lube oil cooling tube will be inspected for fouling and loss of material. Acceptance criteria and corrective actions will be specified.

Clarification: The enhancement references inspection of the raw water side of the bearing housing for 2P-89A and 2P-89B. The enhancement references inspection of the internal surface of the lube oil cooling tube for 2P-89C. Since the affected component environments are service water and lube oil, both fouling and loss of material are adequately managed by the Service Water Integrity Program and the Oil Analysis Programs respectively. Consequently, further inspections per the PSPM program for 2P-89A, 2P-89B, and 2P-89C are not required to manage aging effects requiring management for the HPSI pump bearing cooling units.

Commitment 18175 – Perform a one-time Inspection of selected 10 CFR 54.4(a)(2) components that will determine whether degradation as a result of loss of material is occurring at a rate slow enough to ensure that the intended functions of the components will be maintained during the

period of extended operation (PEO) (2CAN090402, LRA Clarifications, dated September 10, 2004, Request for Additional Information (RAI) 3.3.2.4.11-1). The Post-Accident Sampling System (PASS) is included in the response as a system requiring inspection. The commitment to inspect PASS components is no longer necessary.

Justification: Per letter 0CNA080005, dated August 17, 2000, *Elimination of PASS Requirements*, the NRC issued Amendment No. 218 to Facility Operating License No. NPF-6 for ANO-2. The amendment consisted of changes to the ANO-2 Technical Specifications deleting requirements to maintain PASS. Subsequent to NRC approval for PASS elimination, PASS components were isolated; therefore, one-time inspections of PASS system components are not performed.

Commitment 17940 – For environmentally assisted fatigue (EAF) an incorrect material type was discovered in NUREG-1828, Safety Evaluation Report Related to the License Renewal of ANO-2, Section 4.3.1.3.1 (2CNA040504).

Clarification: The material for the charging nozzle and safety injection nozzle is listed as carbon steel. However, the nozzle stainless steel safe-ends are the critical locations for environmentally assisted fatigue. This results in a revised correction factor of 15.4 rather than 1.74 in the NUREG-6260 table. Therefore, information in letter 2CAN100302, dated October 14, 2003, LRA ANO-2, Section 4.3.3.1, Page 4.3-5 is revised as follows:

NUREG-6260 Item	**Usage Factor**	**Usage Factor with Env. Correction Factor**
Charging nozzle (stainless steel)	0.78	12.012
Safety injection nozzle (stainless steel)	0.3755	5.782

Commitments 17925 and 17936 – PSPM and Wall Thinning Programs (ANO-2 LRA, 2CAN100302, dated October 14, 2003) were modified per letter 2CAN060402, RAI Responses for LRA, dated June 21, 2004, RAI 3.3.2.4.3-2 and are being revised for expansion joints.

Justification: The RAI response specifies non-destructive examination of emergency diesel generator (EDG) and Alternate AC diesel generator expansion joints. During development of a repetitive activity to perform nondestructive examination (NDE) ultrasonic thickness (UT) readings on the expansion joints, it was determined that UT readings of the metal expansion joints was not possible based on the closeness of the convolutions and size of the joints. Based on the inability to perform reliable, repeatable UT on the expansion joints, visual examination of the external surfaces of the expansion joints will be performed in accordance with the PSPM Program frequency with the provision to perform dye penetrant testing if defects are identified.

Commitment 17932 – For the Steam Generator Integrity Program Entergy is clarifying the response to RAI 3.1.2.5-1(1) which was provided in Attachment 2 of letter 2CAN070404, RAI Responses for LRA, dated July 1, 2004.

> RAI 3.1.2.5-1: In Table 3.1.2-5, the applicant identifies the Steam Generator Integrity Program in LRA Section B.1.25 to manage cracking in the following components: anti-vibration bar end caps, peripheral retaining rings, U-bend, and U-shaped retainer bars (page 3.1-100) and stay rods, stay rod hex nuts, spacer pipes, peripheral backup bars, wrapper, and wrapper jacking screws (page 3.1-106). (1) Discuss how these components are inspected and the frequency of inspection under the Steam Generator Integrity Program……
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> Response: (1) The ANO-2 Steam Generator Integrity Program includes visual inspection of the steam generator lower internals (tube support structures and tube bundle including the U-bend). This inspection is completed at least once every five years. This inspection checks for loose parts as well as corrosion and other damage in this region.……

Clarification: The visual inspection of the steam generator lower internals is intended to quantify sludge deposition, identify and remove loose parts, and assess corrosion or damage in the accessible regions of the lower tube bundle. During this inspection, the specific components listed in RAI 3.1.2.5-1 (anti-vibration bar end caps, U-bend peripheral retaining ring, U-shaped retainer bars, stay rods, stay rod hex nuts, spacer pipes, peripheral backup bars, wrapper, and wrapper jacking screws) are not visually inspected. Inspection of these components is not required by the steam generator vendor manual, NEI 97-06 (Steam Generator Program Guidelines), or the Electric Power Research Institute (Steam Generator Management Program Guidelines).

Consequently, the ANO-2 Steam Generator Integrity Program does not perform specialized inspections of the anti-vibration bar end caps, U-bend peripheral retaining ring, U-shaped retainer bars, stay rods, stay rod hex nuts, spacer pipes, peripheral backup bars, wrapper, and wrapper jacking screws. Any degradation found during the normal course of the lower/upper internals inspections or through eddy current testing is further investigated.

Commitment 17925 – The PSPM Program (ANO-2 LRA, 2CAN100302, dated October 14, 2003, Appendix B, Section B.1.18) was modified per letter 2CAN070409, *License Renewal Clarifications*, dated July 22, 2004. Specifically, the following section was added regarding EDG inspections.

> Under the PSPM Program, the expansion joints in the EDG are routinely inspected once every 18 months in accordance with vendor recommendations. Both visual and nondestructive examinations are performed. This includes internal and external inspections that can detect cracking and loss of material.

Justification: Expansion joints are examined concurrently with other related EDG inspections, and the frequency of inspection for the expansion joints is in accordance with the PSPM Program instead of every 18 months.

Commitment 17925 – PSPM Program (ANO-2 LRA, 2CAN100302, dated October 14, 2003, Appendix B, Section B.1.18) was modified per letter 2CAN060402, *RAI for LRA*, dated June 21, 2004. Specifically, the following section was added regarding the Alternate AC Diesel Generator starting air dryer.

Loss of material in the starting air system for the AAC diesel will be managed through the use of periodic maintenance that ensures the proper operation of the air dryers such that significant moisture will not be entrained in the portion of the system that is subject to aging management review.

Justification: An engineering change (EC-65805) replaced the 2C-7 Atlas Copco model LT-20-30 twin cylinder reciprocating starting air unit and the 2M-10 heatless regenerative desiccant dryer system with an air compressor/dryer system which utilizes a Sauer model WP65L compressor and Air Products membrane dehydrator. An air dryer with dew point measurement is not available on the new unit. The new unit is equivalent to the existing compressor/dryer (2C-7A). Periodic maintenance is performed on each unit to ensure significant moisture is not entrained in the system; however, dew point on the alternate AC diesel generator starting air dryer will not be monitored.

Commitment 17929 – The Reactor Vessel Internals (RVI)–Cast Austenitic Stainless Steel (CASS) Program is being deleted.

Justification: The only RVI CASS component is the control element assembly (CEA) shroud tube. The Reactor Vessel Internals – Stainless Steel Plates, Forgings, Welds and Bolting Program per MRP-227-A specifically addresses RVI components fabricated from CASS, martensitic stainless steel, or precipitation hardened stainless steel materials to ensure their functionality is maintained during the PEO considering the potential loss of fracture toughness due to thermal and irradiation embrittlement. Consequently, the specific commitment as outlined in the LRA for RVI CASS is no longer necessary and is being deleted.

Commitments 17917, 17925, and 17931 – The Fire Water System, PSPM, and Service Water Integrity Programs are credited with managing loss of material due to selective leaching.

Clarification: Rather than manage selective leaching through specific component inspections as outlined in these programs, Entergy plans to use a specific Selective Leaching Program for ANO-2 that monitors the aging mechanism of selective leaching in components subject to aging management review. The elements of the program are described below as compared to NUREG 1801, Section XI.M33, *Selective Leaching*.

Selective Leaching Program (Commitment 20017)

1. Scope of Program

a. NUREG – 1801, Scope of Program

This program demonstrates the absence of selective leaching. For materials and environments where selective leaching is currently occurring or for materials in environments where the component has been repaired with the same material, a plant-specific program is required. Components include piping, valve bodies and bonnets, pump casings, and heat exchanger components that are susceptible to selective leaching. The materials of construction for these components may include gray cast iron and uninhibited brass containing greater than 15% zinc. These components may be exposed to raw water, treated water, closed cooling water, ground water, water contaminated fuel oil, or water contaminated lube oil.

b. Comparison to ANO Scope of Program

The selective leaching sample for a given population will be based on components fabricated with susceptible materials (gray cast iron, copper alloys (except for inhibited brass) that contain greater than 15 percent zinc (> 15% Zn) or greater than eight percent aluminum (> 8% Al in the case of aluminum-bronze) in aggressive environment (i.e., raw water, ground water, and waste water).

Selective leaching sample populations and results for ANO-2 are also representative of ANO-1 for common systems and equivalent material/environment combinations. See ANO Common system table below.

ANO Common Systems		
System	**Unit 2 Source**	**Unit 1 Source**
Firewater (FS)	Lake Dardanelle	Lake Dardanelle
Service Water (SW)	Lake Dardanelle	Lake Dardanelle
Emergency Feedwater (EFW)	Condensate or SW	Condensate or SW

Therefore, inspections conducted on ANO-1 components will be credited by the ANO-2 Selective Leaching Program.

This element is not consistent with NUREG XI.M33 Selective Leaching in that only components with an environment of raw water, ground water, and waste water are inspected. Monitoring of water chemistry consistent with AMP XI.M2, Water Chemistry, or AMP XI.M21A, Closed Treated Water Systems, to control pH and concentration of corrosive contaminants in treated water or closed cooling water environments is effective in minimizing Selective Leaching. Therefore, this program is not necessary to manage selective leaching in non-aggressive environments (treated water, closed cooling water, water contaminated fuel oil, or water contaminated lube oil). Lube oil and fuel oil systems are monitored for water intrusion and treated with inhibitors. Consequently, the aqueous environment necessary to cause selective leaching is not present.

2. Preventive Actions

a. NUREG – 1801, Preventive Actions

This program is a condition monitoring program and it contains no preventive actions.

b. Comparison to ANO Preventive Actions

ANO preventive actions will be consistent with NUREG-1801, XI.M33.

3. Parameters Monitored or Inspected

a. NUREG – 1801, Parameters Monitored or Inspected

This program monitors selective leaching through the monitoring of surface hardness and visual appearance (color, porosity, abnormal surface conditions).

b. Comparison to ANO Parameters Monitored or Inspected

The program will monitor selective leaching by performing the following inspection types.

(1) Visual inspections and mechanical examination techniques (e.g., involving chipping or scraping) will be performed opportunistically.

(2) At a minimum, two destructive examinations will be performed in each material group population every ten years. Each component destructively examined is equivalent to visually inspecting two components. Destructive examinations will be used to determine the metallurgical properties (i.e., degree of dealloying, depth of dealloying through wall thickness, and chemical composition).

This is not consistent with NUREG XI.M33 Selective Leaching since destructive testing is conducted in lieu of hardness testing.

4. Detection of Aging Effects

a. NUREG – 1801, Detection of Aging Effects

The visual inspection and hardness measurement or other mechanical examination techniques, such as destructive testing (when the opportunity arises), chipping, or scraping, is a one-time inspection conducted within the last five years prior to entering the PEO. Because selective leaching is a slow acting corrosion process, this measurement is performed just prior to the PEO. Follow-up of unacceptable inspection findings includes an evaluation using the corrective action program and a possible expansion of the inspection sample size and location.

Where practical, the inspection includes a representative sample of the system population and focuses on the bounding or lead components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin. Twenty percent of the population with a maximum sample of 25 constitutes a representative sample size. Otherwise, a technical justification of the methodology and sample size used for selecting components for one-time inspection should be included as part of the program's documentation. Each group of components with different material/environment combinations is considered a separate population.

Selective leaching generally does not cause changes in dimensions and is difficult to detect by visual inspection. However, in certain brasses, it causes plug-type dezincification, which can be detected by visual inspection. One acceptable procedure is to visually inspect the susceptible components closely and conduct Brinell hardness testing (where feasible, based on form and configuration or other industry-accepted

mechanical inspection techniques) on the inside surfaces of the selected set of components to determine if selective leaching has occurred. If selective leaching is apparent, an engineering evaluation is initiated to determine acceptability of the affected components for further service.

b. Comparison to ANO Detection of Aging Effects

Visual inspections and mechanical examination techniques (e.g., involving chipping or scraping) will be conducted under this program opportunistically. At a minimum, in each 10-year period during the PEO, a sample of three percent of the population (defined as NUREG-1801, Rev 2 XI.M33 December 2010, components having the same material) or a maximum of 10 components per population will be inspected. Where practical, the visual inspection focuses on the bounding or lead components most susceptible to aging because of time in service and severity of operating conditions. This minimum sample size does not override the opportunistic inspection basis of this aging management program. Opportunistic inspections would still be conducted even though in a given 10-year period, three percent or 10 components might have already been visually inspected.

Visual inspections include all accessible surfaces. In certain brasses, selective leaching causes plug-type dezincification, which can be detected by visual inspection. Selective leaching of gray iron usually shows rusting and in some cases a surface layer with the appearance of graphite, which can be detected by visual inspection. Mechanical examination techniques such as chipping and scraping should augment visual inspections for gray iron components. Unless otherwise required (e.g., by the ASME code), all inspections are carried out using plant-specific procedures by inspectors qualified through plant-specific programs.

A destructive examination provides more information than a visual inspection. At a minimum, two destructive examinations will be performed in each material group population. The applicant may take credit for each component destructively examined as being equivalent to visually inspecting two components. Destructive examinations will be used to determine the metallurgical properties (i.e., degree of dealloying, depth of dealloying through wall thickness, and chemical composition).

This is not consistent with NUREG XI.M33 Selective Leaching since periodic inspections will be performed. In addition, destructive testing is conducted in lieu of hardness testing. Also, the sampling method used is as follows during a ten-year period.

a) Opportunistic (visual/scraping)

b) At least a three percent sample or ten components (visual/scraping)

c) At least two destructive tests

5. Monitoring and Trending

a. NUREG – 1801, Monitoring and Trending

This is a one-time inspection to determine if selective leaching is an issue. Monitoring and trending is not required.

b. Comparison to ANO Monitoring and Trending

The program will monitor and trend examination results to indicate whether the progression of dealloying is occurring. Mechanical properties (e.g., minimum wall thickness) will be projected until the next inspection period to confirm structural integrity is maintained.

This is not consistent with NUREG XI.M33 Selective Leaching since inspections will occur periodically and will be trended.

6. Acceptance Criteria

a. NUREG – 1801, Acceptance Criteria

The acceptance criteria are no visible evidence of selective leaching or no more than a 20 percent decrease in hardness. For copper alloys with greater than 15 percent zinc, the criterion is no noticeable change in color from the normal yellow color to the reddish copper color.

b. Comparison to ANO Acceptance Criteria

The criterion for uninhibited copper alloys with greater than 15 percent zinc is no noticeable change in color from the normal yellow color to the reddish copper color. The criterion for gray cast iron is the absence of a surface layer with the appearance of graphite that can be easily removed by cutting or scraping. System components shall meet system design requirements such as minimum wall thickness.

This is not consistent with NUREG XI.M33 Selective Leaching since no hardness testing is performed. Consistent with industry operating experience, hardness testing is not an effective method of identifying selective leaching. Destructive testing will be performed in lieu of hardness testing.

7. Corrective Actions

a. NUREG – 1801, Corrective Actions

Engineering evaluations are performed for test or inspection results that do not satisfy established acceptance criteria. The corrective actions program ensures that conditions adverse to quality are promptly corrected. If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude repetition. As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions. Unacceptable inspection findings result in additional inspection(s) being performed, which may be on a periodic basis, or in component repair or replacement.

b. Comparison to ANO Corrective Actions

Engineering evaluations are performed for inspection results that do not satisfy acceptance criteria or trending that does not confirm structural integrity will be maintained until the next inspection period. The corrective actions program ensures that conditions adverse to quality are corrected. If the deficiency is assessed to be a significant condition adverse to quality, the cause of the condition is determined and an action plan is developed to preclude repetition. As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions. Unacceptable inspection findings result in additional inspection(s) being performed, which may be on a periodic basis, or in component repair or replaced. The program will be consistent with element 7.

8. Confirmation Process

a. NUREG – 1801, Confirmation Process

Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process and administrative controls.

b. Comparison to ANO Confirmation Process

The program will be consistent with element 8.

9. Administrative Controls

a. NUREG – 1801, Administrative Controls

The administrative controls for this program provide for a formal review and approval of corrective actions. The administrative controls for this program are implemented through the site's QA program in accordance with the requirements of 10 CFR Part 50, controls Appendix B.

b. Comparison to ANO Administrative Controls

The program will be consistent with element 9.

10. Operating Experience

a. NUREG – 1801, Operating Experience

The elements that comprise these inspections (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice and staff expectations. Selective leaching has been detected in components constructed from cast iron, brass, bronze, and aluminum bronze. Components affected have included valve bodies, pump casings, piping, and cast-iron fire protection piping buried in soil.

b. Comparison to ANO Operating Experience

The program will be consistent with element 10.

Attachment 2 to

2CAN041801

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy Operations, Inc. in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check One)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
Commitment 17927 – The Reactor Vessel Head Penetration Inspection Program is being deleted.		N/A	N/A
Commitment 17925 – The Periodic Surveillance and Preventative Maintenance (PSPM) Program is revised to reflect that high-pressure safety injection pumps 2P-89A, 2P-89B, and 2P-89C lube oil and service water environments are managed by the Oil Analysis and Service Water Integrity Programs, respectively.		X	July 17, 2018
Commitment 18175 – The One-Time Inspection Program is revised to reflect that Post-Accident Sampling System components are not inspected.		N/A	N/A
Commitment 17940 – This clarifies that the stainless steel charging nozzle and safety injection nozzle usage factors with environmental correction factor are 12.012 and 5.782, respectively.		X	July 17, 2018
Commitments 17925, PSPM Program, and 17936, Wall Thinning Program – These are revised to reflect that the emergency diesel generator and Alternate AC diesel generator expansion joints will receive visual external examinations and dye penetrant testing if defects are identified rather than ultrasonic inspection.		X	July 17, 2018

Commitment 17932 – The Steam Generator Integrity Program does not perform specialized inspections of the anti-vibration bar end caps, U-bend peripheral retaining ring, U-shaped retainer bars, stay rods, stay rod hex nuts, spacer pipes, peripheral backup bars, wrapper, and wrapper jacking screws.		X	July 17, 2018
Commitment 17925 – The PSPM Program is revised to reflect that the EDG expansion joints are examined in accordance with the PSPM Program.		X	July 17, 2018
Commitment 17925 – The PSPM Program is revised to reflect dew point on the alternate AC diesel generator starting air dryer will not be monitored.		X	July 17, 2018
Commitment 17929 – Reactor Vessel Internals – Cast Austenitic Stainless Steel is deleted.		N/A	N/A
Commitments 17917, 17925, and 17931 – The Fire Water System, PSPM, and Service Water Integrity Programs are revised to reflect that a separate program to manage selective leaching will be implemented.		N/A	N/A
Commitment 20017 – Implement the ANO-2 Selective Leaching Program.		X	July 17, 2018