FAQ Log March 2018

FAQ No.	PI	Topic	Status	Plant/Co.	Point of Contact
18-01	IE	Definition of Initial Transient	Introduced January 31 Discussed March 1	Generic	Ken Heffner (Certrec) Alex Garmoe (NRC)
18-02	IE	Watts Bar 2 IE01 and IE03 Effectiveness Date	Introduced March 1	Watts Bar Unit 2	Kim Hulvey/Beth Wetzel (TVA) Alex Garmoe (NRC)
18-03	IE	Plant-specific exemption from guidance	Introduced March 1	Columbia	Desirée Wolfgramm (Energy Nothwest) Alex Garmoe (NRC)

For more information, contact: James Slider, (202) 739-8015, jes@nei.org

FAQ 18-01
Definition of Initial Transient

NOTE
This FAQ would implement a whitepaper that proposed clarifications of the definition of "Initial Transient". The whitepaper was discussed with the NRC staff in public ROP meetings in 2013-2014. The final discussion of the whitepaper occurred at a May 14, 2014 public meeting. The NRC staff member who had the lead on performance indicators at the time was Andrew Waugh, who is listed below as the NRC Contact. The concluding discussion is documented in an NRC meeting summary available in ADAMS at accession number ML14149A293. The proposed text changes presented below reflect NRC comments and suggested edits for agency approval presented in a mark-up of the whitepaper attached to the aforementioned meeting summary. The marked-up whitepaper is available under ADAMS accession number ML14149A278.

Plant: Generic
Date of Event: September 11, 2014
Submittal Date: September 11, 2014
Licensee Contact: Lenny Sueper **Tel/email:** 612-330-6917 / Leonard.Sueper@xenuclear.com
NRC Contact: Andrew Waugh **Tel/email:** (301) 415-5601 / andrew.waugh@nrc.gov

Performance Indicator: IE04 – Unplanned Scrams with Complications
Site-Specific FAQ (see Appendix D)? No – this is generic
FAQ to become effective: When approved

Question Section
NEI 99-02 Guidance needing interpretation (include page and line citation):

Page 23 Line 20:
20 Was pressure control unable to be established following the initial transient?

Page 24 Lines 39 - 40:
39 Following initial transient, did stabilization of reactor pressure/level and drywell pressure
40 meet the entry conditions for EOPs?

Event or circumstances requiring guidance interpretation:

Two of the questions in NEI 99-02 used to determine if a BWR reactor trip was an Unplanned Scram with Complications include the undefined term "initial transient"; "Was pressure control unable to be established following initial transient?" and "Following initial transient did stabilization of reactor pressure/level and drywell pressure meet the entry conditions for EOPs?" The failure to define the term has resulted in confusion, with some licensees interpreting "initial transient" to be equivalent to "scram response".

If licensee and NRC resident/region do not agree on the facts and circumstances, explain:
N/A

Potentially relevant FAQs: None

Response Section
Proposed Resolution of FAQ:
The following is proposed to be added in the Definition of Terms section of this indicator:

Initial Transient is intended to envelope the immediate and expected changes to BWR parameters as a result of a scram (e.g., pressure, level, etc.) because of the collapsing of voids in the core and the routine response of the main feedwater and turbine control systems. For example, at some BWRs the

reflected pressure wave resulting from the rapid closure of turbine valves during a turbine trip may result in a pressure spike in the reactor vessel that causes one or more safety-relief valves (SRVs) to briefly lift. The intent is to allow a licensee to exclude the momentary operation of SRVs when answering “Was pressure control unable to be established?” The sustained or repeated operation of SRVs in response to turbine control bypass valve failures or Main Steam Isolation Valve (Group I) isolations are not a part of routine BWR scram responses and are therefore not considered to occur within the initial transient. Similarly, a reactor level decrease to Level 3 following a reactor trip due to the expected collapsing of voids in the core can be excluded when answering the question “Following initial transient, did stabilization of reactor pressure/level and drywell pressure meet the entry conditions for EOPs?” as long as the feedwater control system and at least one feedwater pump were operating as designed. “Initial transient” is different from “scram response”. The initial transient is a subset of the overall scram response time.

If appropriate, provide proposed rewording of guidance for inclusion in next revision:
See above.

PRA update required to implement this FAQ? No

MSPI Basis Document update required to implement this FAQ? No

FAQ 18-02
Watts Bar Critical Hours

Plant: **Watts Bar Nuclear Plant, Unit 2 (WBN 2)**

Date of Event: 12/31/2017
Submittal Date: 2/21/2018
Engineer/Licensee Contact: Kim Hulvey/Beth Wetzel
Tel/email: (423) 365-7720/(423)751-2403
NRC Contact Jared Nadel Watts Bar Tel/email: (423) 365-1776

Performance Indicators:
IE01 WBNU2 Unplanned Scrams per 7000 Critical Hours (automatic and manual scrams during the previous four quarters)
IE03 WBNU2 Unplanned Power Changes per 7000 Critical Hours (over previous four quarters)

Site-Specific FAQ (Appendix D)? - Yes

FAQ to become effective when approved.

Question Section:

TVA requests the effective date of Watts Bar Unit 2 Unplanned Scrams per 7000 Critical Hours (IE01) and (IE03) Unplanned Power Changes per 7000 Critical Hours be extended until 3Q18 (through Jun 30, 2018) to allow sufficient data for an accurate assessment value. This request is based upon a October 22, 2015 NRC letter to TVA stating "If, as the licensee approaches four quarters after either the IE or MS cornerstones become monitored, new information shows that a PI may still not provide accurate assessment value, the Frequently Asked Questions process will be utilized in accordance with NEI 99-02 to reach a conclusion on how to proceed."

NEI 99-02 Guidance needing interpretation:

NRC Letters to TVA dated November 21, 2016 (ML16326A210) and October 22, 2015 (ML15295A253).

NEI 99-02 Page 10 line 25
The number of unplanned scrams during the previous four quarters, both manual and automatic, while critical per 7,000 hours.

NEI 99-02 Page 14 line 9
The number of unplanned changes in reactor power of greater than 20% of full-power, per 7,000 hours of critical operation excluding manual and automatic scrams.

NEI 99-02 Page E-1 line 12
There are several reasons for submitting an FAQ:

NEI 99-02 Page E-1 line18
3. To request an exemption from the guidance for plant-specific circumstances, such as design features, procedures, or unique conditions.

Event or circumstances requiring guidance interpretation:

This FAQ concerns the Watts Bar Unit 2 new plant startup and subsequent March 23, 2017 Main Condenser failure that resulted in an estimated loss of 3100 critical hours for repair. The reactor was

shut down from March 23, 2017 until July 30, 2017 while extensive repairs were completed to the Main Condenser. The cause of the failure was inadequate vendor design (1970's vintage) of the condenser wall support structure leading to support and wall failure. In addition, an extended 39 day refueling outage was completed in the fourth Quarter of 2017. This resulted in an additional estimated loss of 930 critical hours. Being the first refueling outage following WBN Unit 2 commercial operation, many additional tests were required to meet commitments as dictated by the operating license. This resulted in a longer than baseline outage.

The main condenser repairs coupled with the extended refueling outage has resulted in a low number of critical hours (approximately 4588) for the period defined in the Oct 22, 2015 letter. For related background, WBN Unit 2 experienced two scrams and one unplanned power change for the previous 4 quarters. Details are as follows:

- A 1Q17 scram was caused when workers inadvertently depressed a local trip pushbutton on a Hotwell Pump. The pump trip resulted in a secondary plant transient and subsequent reactor scram. The event was attributed to human performance in that workers failed to practice situational awareness around scram sensitive equipment. Corrective actions included coaching Operations personnel on the need to control work activities near operating equipment and installation of bump guard covers on local pushbuttons for a number of Unit 2 secondary pumps.
- A 4Q17 scram was caused by an intermittent circuit card connection in the 2AC Rod Control Power Cabinet. The equipment malfunction resulted in 4 dropped control rods and a subsequent manual reactor scram by control room operators. Corrective actions included a 100% inspection of circuit card connections in the Rod Control Power Cabinets and replacement of suspect cards. No common cause was assessed to exist between the two scrams.
- A 3Q17 unplanned power change was caused by a Main Turbine steam leak.

If licensee and NRC resident/region do not agree on the facts and circumstances explain:

The NRC Watts Bar Site Resident Inspector was informed of this FAQ.

Potentially relevant FAQ's:

FAQ 13-01 Turkey Point Unplanned Scrams per 7000 Hours Critical
FAQ 17-04 Watts Bar Unit 2 MSPI Effectiveness Date

Response Section:

Proposed Resolution of FAQ:

Due to the uniqueness of new construction and starting-up a new unit, TVA requests a two quarter extension to the effective date for WBN Unit 2 IE01 and IE03 indicators (July 1, 2018) due to the loss of a significant number of critical hours. The IE01 indicator objective is to limit the frequency of those events that upset plant stability and challenge critical safety functions during power operations. The IE03 indicator monitors the number of unplanned power changes that could challenge safety functions. NEI 99-02 states that the indicators are based on 7000 critical hours which provides allowance for a routine outage. As of December 31, 2017, the total number of reported critical hours for 2017 was 4588. Extending the effective date to July 1, 2018 will allow four quarters of operation after the extended main condenser repair shutdown to provide a representative assessment result.

Additionally and unique to WBN Unit 2 as a newly licensed plant and in an NRC letter dated October 22, 2015 titled "Watts Bar Nuclear Plant, Unit 2 - Reactor Oversight Process Implementation and Partial Cornerstone Transition - Docket No. 50-0391," the NRC provided a ROP transition plan. The plan stated IE01, IE03 and some MS performance indicators will not become valid (monitored only) until at least four (4) quarters after the cornerstone has been transitioned to the ROP. WBN Unit 2 transitioned to full ROP oversight on November 21, 2016. The 2015 letter also stated "If, as the licensee approaches four quarters after either the IE or MS cornerstones become monitored, new information shows that a PI may still not provide accurate assessment value, the Frequently Asked Questions process will be utilized in accordance with NEI 99-02 to reach a conclusion on how to proceed."

Similar to this FAQ request, FAQ 17-04, Watts Bar Unit 2 MSPI Effectiveness Date, was recently approved by the NRC to grant an extension for MS01 (Emergency AC Power System), MS07 (High Pressure Injection System), MS08 (Heat Removal System) and MS10 (Cooling Water Systems). The basis for this extension was the loss of critical hours within the first 12 months of operation due to the main condenser repair outage.

If appropriate, provide proposed rewording of guidance for inclusion in next revision: None

PRA update required to implement this FAQ? No

MSPI Basis Document update required to implement this FAQ? No

FAQ 18-03
Columbia Scram Exemption Request

Plant:	Columbia Generating Station	
Date of Event:	August 20, 2017	
Submittal Date:		
Licensee Contact:	Desirée Wolfgramm	Tel/email: 509-377-4792 dmwolfgramm@energy-northwest.com
NRC Contact:	Alex Garmoe	Tel/email: 301-415-3814 alexander.garmoe@nrc.gov

Performance Indicator: Unplanned Scrams with Complications
Site-Specific FAQ (see Appendix D)? Yes
FAQ to become effective when approved.

Question Section

Nuclear Energy Institute (NEI) 99-02 Guidance needing interpretation (include page and line citation):

- NEI 99-02, Revision 7, Page 24, lines 45-46, and
- NEI 99-02, Revision 7, Page 25, lines 1-3

Event or circumstances requiring guidance interpretation:
This FAQ this is being submitted to request a plant-specific exemption from the guidance related to Unplanned Scrams with Complications (USwC) for Columbia due to the unique circumstances of the event which led to operators intentionally reducing pressure in the reactor pressure vessel (RPV) post scram resulting in a second +13 inch scram common to Boiling Water Reactor (BWR) designs.

On August 20, 2017, Columbia Generating Station (Columbia) operators manually scrammed the reactor in response to condenser vacuum degradation following an air removal valve closure. The scram was performed per procedure to prevent an automatic turbine trip (resulting in an automatic reactor scram), main steam isolation valve (MSIV) closure, and reactor feed turbine trip – all of which occur at various low condenser vacuum setpoints. Condenser vacuum was recovered before any of these actions could occur.

For BWRs, RPV water level responds to changes in RPV pressure following a reactor scram. Specifically, RPV water level reaches the Emergency Operating Procedure (EOP) entry criteria of Level 3, +13 inches, due to collapsing of voids when the turbine throttle and governor valves go closed to isolate steam flow to the turbine, reference NEI 99-02 FAQ 18-01, Definition of Initial Transient. During this pressure transient, there is no loss of water inventory in the vessel. In response to this, operators will enter the EOPs (Plant Procedures Manual (PPM) 5.1.1 for Columbia) and initial RPV level control will be with the feedwater level control system in automatic and RPV pressure control will be with the turbine bypass valve control system in automatic. Operators will then transition level control from reactor feed turbine automatic control to throttling with the start-up level control valves in automatic control. This transition is directed per procedures and allows for more precise level control in low feed flow conditions. During this transition, operators take manual control of the reactor feed turbine speed and the level control valve position per procedure. An initial level band is established using available injection systems in order of preference. For Columbia this band is from +13 inches to +54 inches. The feedwater level control valves control level in automatic. During a normal BWR scram, pressure drops during the initial void collapse and will restore automatically once the turbine bypass valve control system responds.

For the event on August 20, 2017, following the reactor scram, condenser vacuum continued to slowly deteriorate. Continued degradation of condenser vacuum could result in closure of the MSIVs

and a loss of reactor feed pumps. Prior to exiting the normal scram response procedure (PPM 3.3.1) and EOP (PPM 5.1.1) approximately 18 minutes after the initial scram, operators took action to lower RPV pressure to maintain the availability of the condensate system to control RPV level. This was an intentional operator action to reduce reactor pressure to maximize the time that the condenser could be used to reject energy from the RPV. It also rejected energy into the main condenser that would otherwise have been rejected to the suppression pool through the main steam safety/relief valves (SRVs) following MSIV closure. During the pressure reduction, the allowable cool down rates were not exceeded.

At the beginning of the pressure reduction, operators controlled RPV level in automatic midway between the established level band of +13 inches to +54 inches at the normal value of +36 inches. This value can allow for RPV level swell, which occurs at the beginning of the pressure reduction, similar to effects seen in a steam generator for a Pressurized Water Reactor (PWR). Control of initial RPV level is crucial to prevent the RPV level swell from reaching the Level 8 setpoint, which occurs at +54.5 inches. At Level 8, the reactor feed pumps trip and the high pressure core spray (HPCS) and reactor core isolation and cooling (RCIC) system injections automatically terminate, if running.

When the desired pressure was attained the turbine bypass valves were throttled closed to terminate the pressure reduction thereby maintaining RPV pressure in the specified band. This resulted in an expected shrinkage of RPV water level due to collapsing of voids, similar to what occurs following a BWR scram. The RPV water level again momentarily dropped below the +13 inch (Level 3) setpoint while the feedwater level control system responded. Reactor water level was restored to normal levels automatically in less than a minute without operator action. The effects of swelling and shrinkage do not represent a loss of inventory in the reactor pressure vessel.

BWR operators need to account for swelling and shrinkage when depressurizing the RPV. However, while reaching the Level 8 setpoint upon water level swell will result in undesirable termination of inventory injection systems, reaching the Level 3 setpoint upon water level shrinkage does not result in any undesirable effects. That is, for BWRs, following a scram and initial RPV level excursion below +13 inches, there is no operational impact to a subsequent momentary level excursion below +13 inches during a controlled fast reduction in RPV pressure when the scram has not yet been reset since there are no additional actuations or complications. Inventory is not lost during shrinkage, all feedwater capability is still available and condensate is in service. Due to the condensate system in service and the feedwater system availability, reaching the Level 3 setpoint has no operational impact. In comparison, at Level 2, -50 inches, HPCS and RCIC, among other systems, will initiate automatically when accident conditions exist. The actuations at Level 2 create additional operator action to secure systems once started.

Per NEI 99-02 Rev 7 guidance, page 25, this scram was counted as an USwC due to the second reactor water level scram signal during the scram response. Energy Northwest requests an exemption from reporting as an USwC due to the unique circumstances of this event which led to operators intentionally reducing pressure in the RPV post scram per station procedures resulting in a second +13 inch scram common to BWR designs. For BWRs post-scram responses in which a rapid RPV pressure reduction results in a subsequent reactor water level scram signal provides no additional operational challenges when the RPV level response was the result of intended operator actions, no accident conditions exist, available systems automatically recover level to above the Level 3 (scram) setpoint, and no additional actuations or complications occur.

NEI 99-02 Rev 7 page 19 states that the purpose for the USwC is to monitor “scrams that either require additional operator actions beyond that of the normal scram or involve the unavailability of or inability to recover main feedwater.” Common to BWR plant designs, a controlled fast reduction in

RPV pressure performed as part of approved procedures using forethought and operational knowledge which results in a momentary low level below the scram setpoint presents no additional operator action to restore RPV level. Feedwater flow remains available and able to automatically recover RPV level. Therefore, for a BWR, this event does not meet the intent of the complicated scram Performance Indicator (PI). As discussed in FAQ 18-01, Definition of Initial Transient, the expected collapsing of voids did not represent an inventory loss and feedwater from both main feedwater pumps was available during the transient, therefore no abnormal condition pertaining to water inventory existed.

NEI 99-02 Rev 7 page 24 lines 45-46 and page 25 line 1 states the following:

> *The requirement to remain in the EOPs because of reactor pressure/water level and drywell pressure following the initial transient indicates complications beyond the typical reactor scram.*

As described in the event for Columbia and typical of BWR plant response, the initial expected level excursion below +13 inches requires entry into the EOPs as discussed in FAQ 18-01, Definition of Initial Transient. However, no additional actions were taken in the EOPs to restore RPV level for the expected first or second level excursion as no emergency existed, and the feedwater level control system operated as designed; therefore, there was no requirement to "remain in the EOPs".

From page 25 lines 2-3, "Additionally, reactor water level scram signal(s) during the scram response indicate level could not be stabilized and require this question be answered — "Yes."" Although a BWR experiences a 'reactor water level scram signal' at the +13 inch setpoint during a controlled fast reduction in RPV pressure due to void collapse, this does not indicate that RPV level cannot be stabilized. As experienced by Columbia's event on August 20, 2017, and then subsequently demonstrated in Columbia's simulator, the subsequent +13 inch RPV water level excursion is an expected evolution that lasts for less than a minute and is automatically restored and stabilized by the feedwater level control system.

If licensee and NRC resident/region do not agree on the facts and circumstances, explain:
This event was counted as an Unplanned Scram with Complications due to the second reactor water level scram signal during the scram response. The licensee asks that the NRC reconsider this event as an uncomplicated scram for Columbia due to the unique circumstances of the event which led to operators intentionally reducing pressure in the RPV post scram per station procedures resulting in a second +13 inch scram common to BWR designs. The language in NEI 99-02 for this PI is overly restrictive and does not allow for events such as this where there are no operational impacts of momentarily reaching additional reactor water level scram signals where no emergency exists. As described above no emergency existed pertaining to reactor pressure or level, and operators were not required to "remain in the EOPs". This level excursion below +13 inches was an expected evolution and did not "present additional challenges to the plant operators" NEI 99-02 page 19 line 6.

Potentially relevant FAQs:
FAQ 18-01, Definition of Initial Transient

<u>Response Section</u>

Proposed Resolution of FAQ:
This FAQ is proposed as a plant-specific exemption for this event as an uncomplicated scram for Columbia due to the unique circumstances of the event which led to operators intentionally reducing pressure in the RPV post scram per station procedures resulting in a second +13 inch scram common

to BWR designs. This event was the result of intended operator actions, no accident conditions existed, available systems automatically recovered reactor water level above the scram setpoint, and no additional actuations or complications occurred.

If appropriate, provide proposed rewording of guidance for inclusion in next revision:
NA

PRA update required to implement this FAQ? No

MSPI Basis Document update required to implement this FAQ? No

Attachment: August Scram Timeline

AR-V-1 Closure

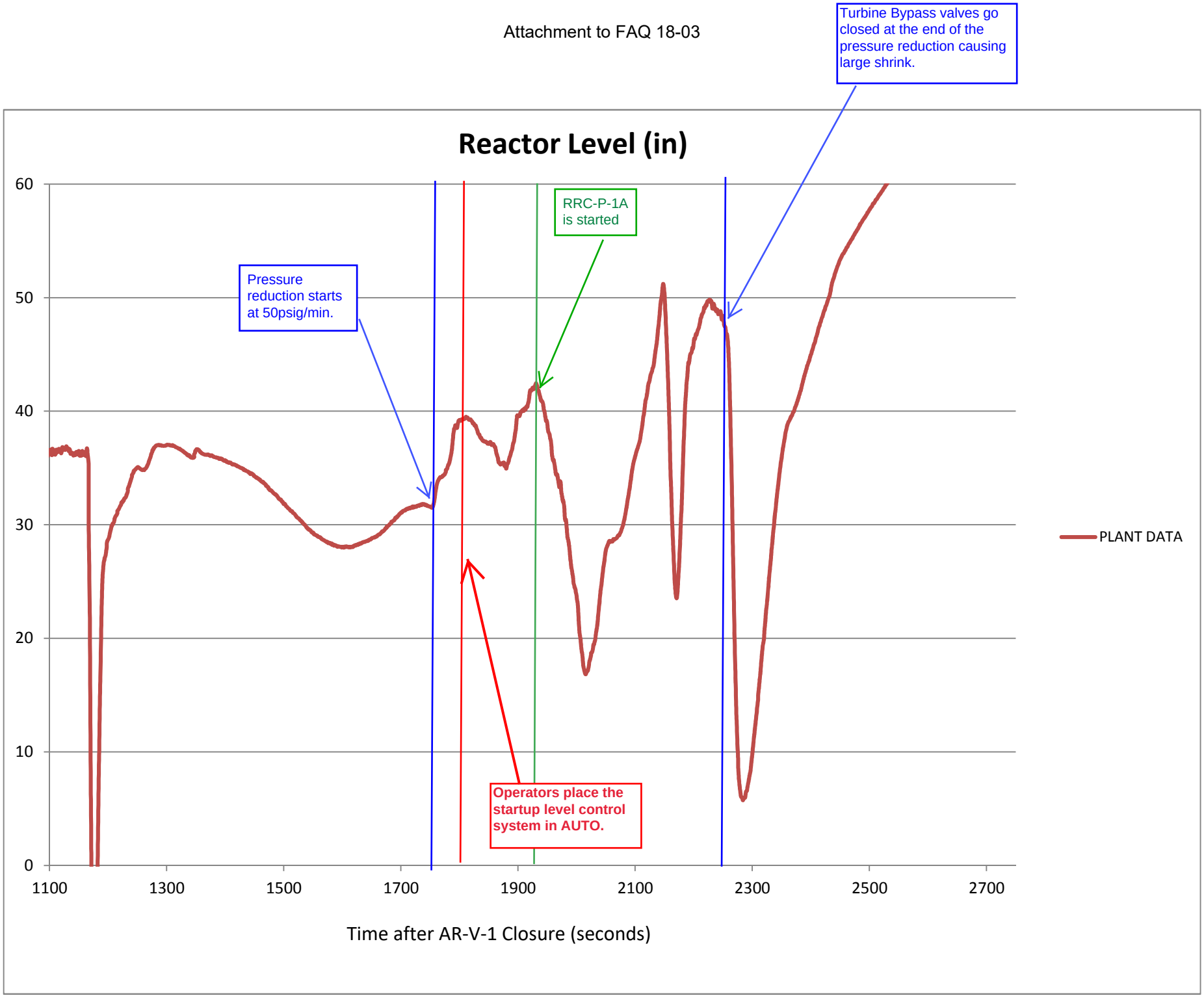
August 20th, 2017 15:47:15

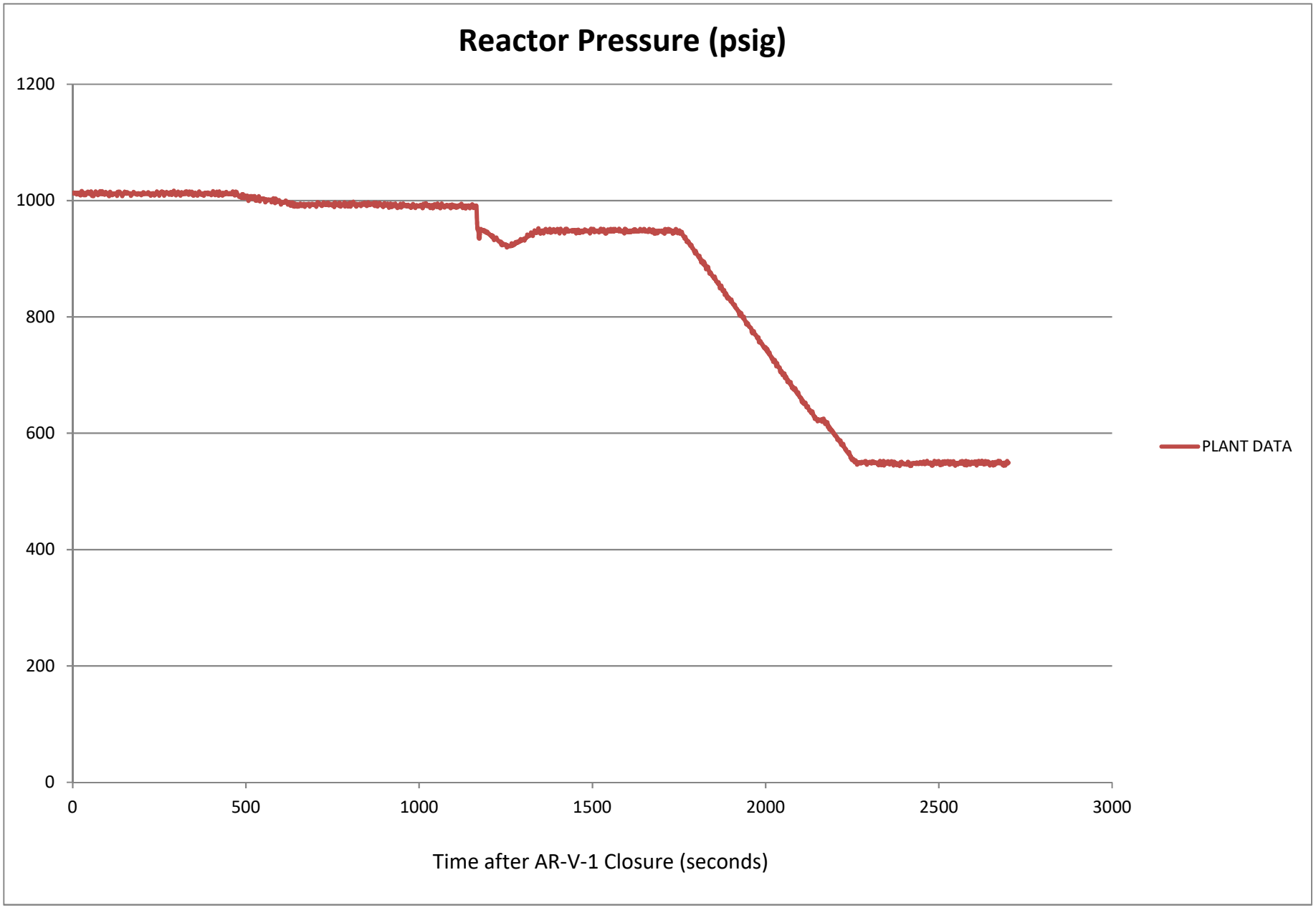
Sequence of events (times are in seconds):

Time after AR-V-1 Closure (hh:mm:ss)	Actual Clock Time (hh:mm:ss)	Description
00:00:00	15:47:15	Air Removal Valve (AR-V-1) closed as observed by vacuum degradation. Vacuum degrades at about 0.26 in Hg per minute.
00:06:43	15:53:58	Operators begin reducing flow from 96Mlb/hr to 70Mlb/hr.This is expected operator response due to degrading condenser vacuum.
00:09:59	15:57:14	Operators complete reducing flow to 70Mlb/hr
00:13:39	16:00:54	Operators begin reducing flow from 70Mlb/hr to 67Mlb/hr
00:14:13	16:01:29	Operators complete reducing flow to 67Mlb/hr
00:18:25	16:05:39	Reactor SCRAM. Reactor Recirculation (RRC) pumps trip on End of Cycle Recirculation Pump Trip (EOC-RPT). Turbine Trips. This is an expected plant response for a scram due to elevated backpressure.
00:18:25	16:05:43	+ 13 inch low Reactor Pressure Vessel (RPV) level. Normal plant response as expected for a scram at power.
00:18:47	16:06:02	+ 13 inch low RPV level clear. Expected plant response.
00:23:57	16:11:13	Operators begin opening Reactor Feedwater Flow Control Valve (RFW-FCV-10A) manually. Expected operator response per procedure.
00:27:15	16:14:30	Operators manually close RFW-FCV-10A and RFW-FCV-10B. Valves are closed at 16:15:24 (1749). Operators place the startup level control system in AUTO. Observed based on startup controller demand vs RPV level and obvious tracking of an automatic system.
00:28:14	16:15:29	Operators reduce pressure at 50psig per minute. Final pressure is 550psig. Intentional pressure reduction per operator procedure.

00:31:34	16:18:49	Operators start RRC-P-1A. The feedwater control system inserts a large amount of feedwater to compensate for lowering RPV level. Operators start RRC-P-1A.
00:35:46	16:22:01	Feedwater Pumps trip on Level 8. This is based on plant data from RFW-DPT-4B (B028) and RFW.
00:37:07	16:23:22	Turbine Bypass valves rapidly close with RPV pressure at 550psig. This is expected plant response.
00:37:50	16:24:05	+ 13 inch low RPV level. This is expected plant response after the closure of the turbine bypass valves after securing the pressure reduction.
00:38:41	16:24:56	+ 13 inch low RPV level clear. Expected plant response for systems in automatic.

Attachment to FAQ 18-03




Reactor Pressure (psig)
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
3000
PLANT DATA
Time after AR-V-1 Closure (seconds)


Reactor Level (in)
60
50
40
30
20
10
0
0
500
1000
1500
2000
2500
3000
PLANT DATA
SIMULATOR
Time after AR-V-1 Closure (seconds)