INL/MIS-19-56555-Revision-0

AGR-5/6/7 Experiment Status as of the End of Cycle 166A

Joe Palmer

November 2019

The INL is a U.S. Department of Energy National Laboratory
operated by Battelle Energy Alliance

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AGR-5/6/7 Experiment Status as of the End of Cycle 166A

Joe Palmer

November 2019

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AGR-5/6/7 Operations Summary from Start of Irradiation Through First Half of Cycle 166A

Technical Coordination Team

November 11, 2019

Joe Palmer

Mechanical Engineer, PE

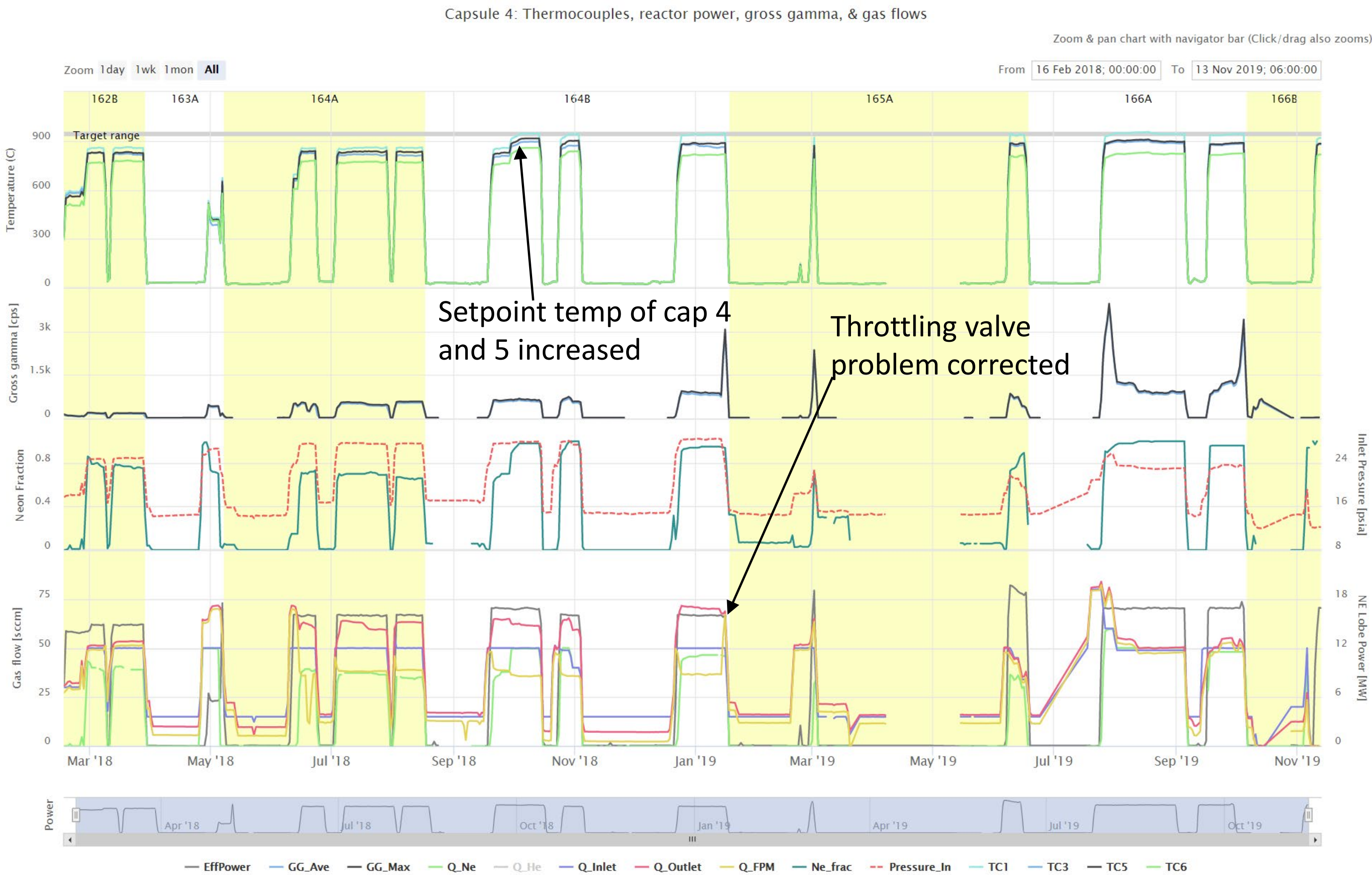
ADVANCED REACTOR TECHNOLOGIES

Overall, the first three cycles of irradiation proceeded as planned

Items of note:

- Failure rate of thermocouples was higher than expected
- Downstream needle valves were throttled resulting in part of exhaust flow being diverted prior to reaching fission product monitors (this was corrected near the end of cycle 164B)
- No evidence of fuel failures on fission product monitoring system

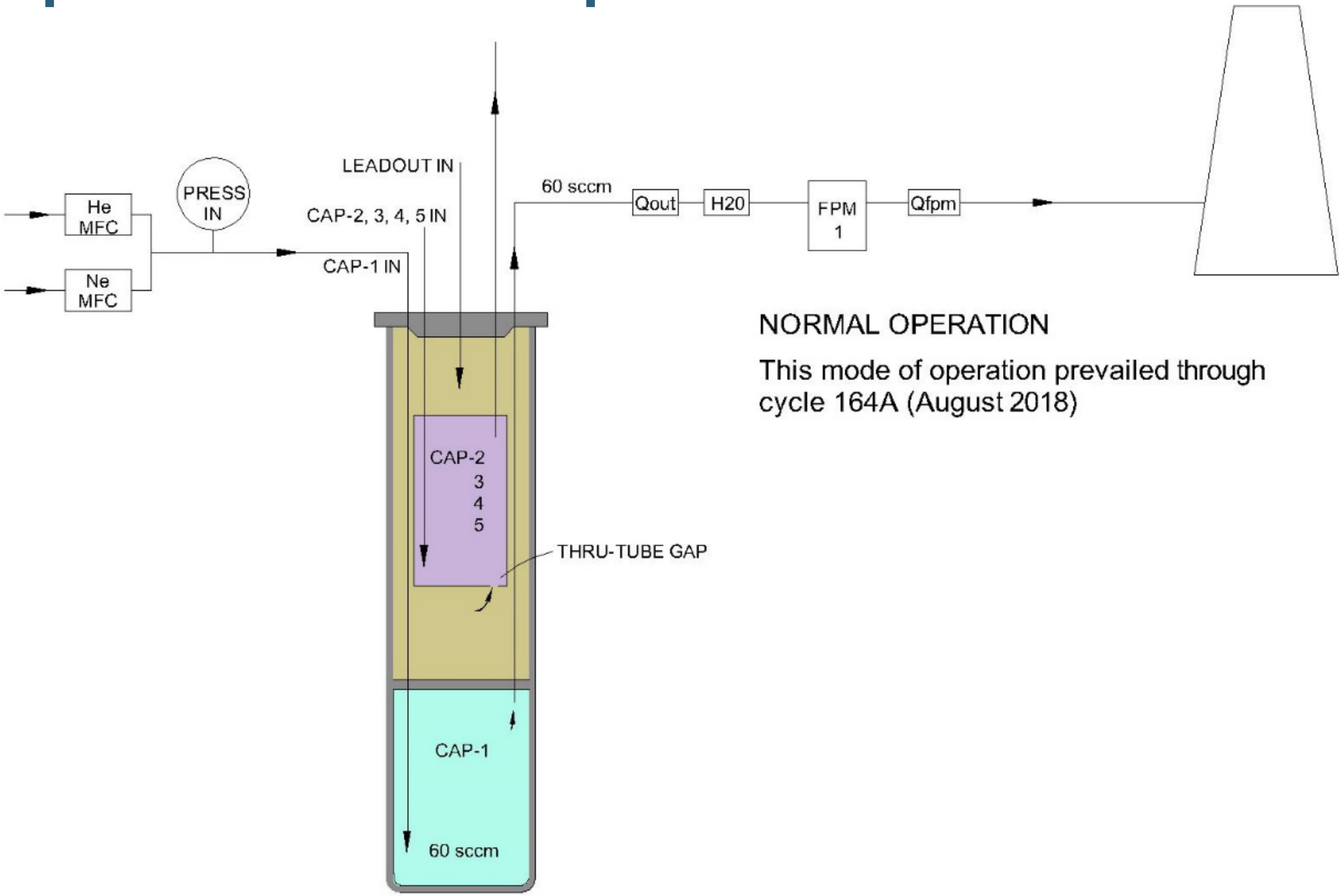
Capsule 4 NDMAS data for entire irradiation



The balance of this presentation will focus primarily on capsule 1

- At the beginning of the fourth cycle, cycle 164B a rapid increase in the capsule 1 inlet pressure was noted

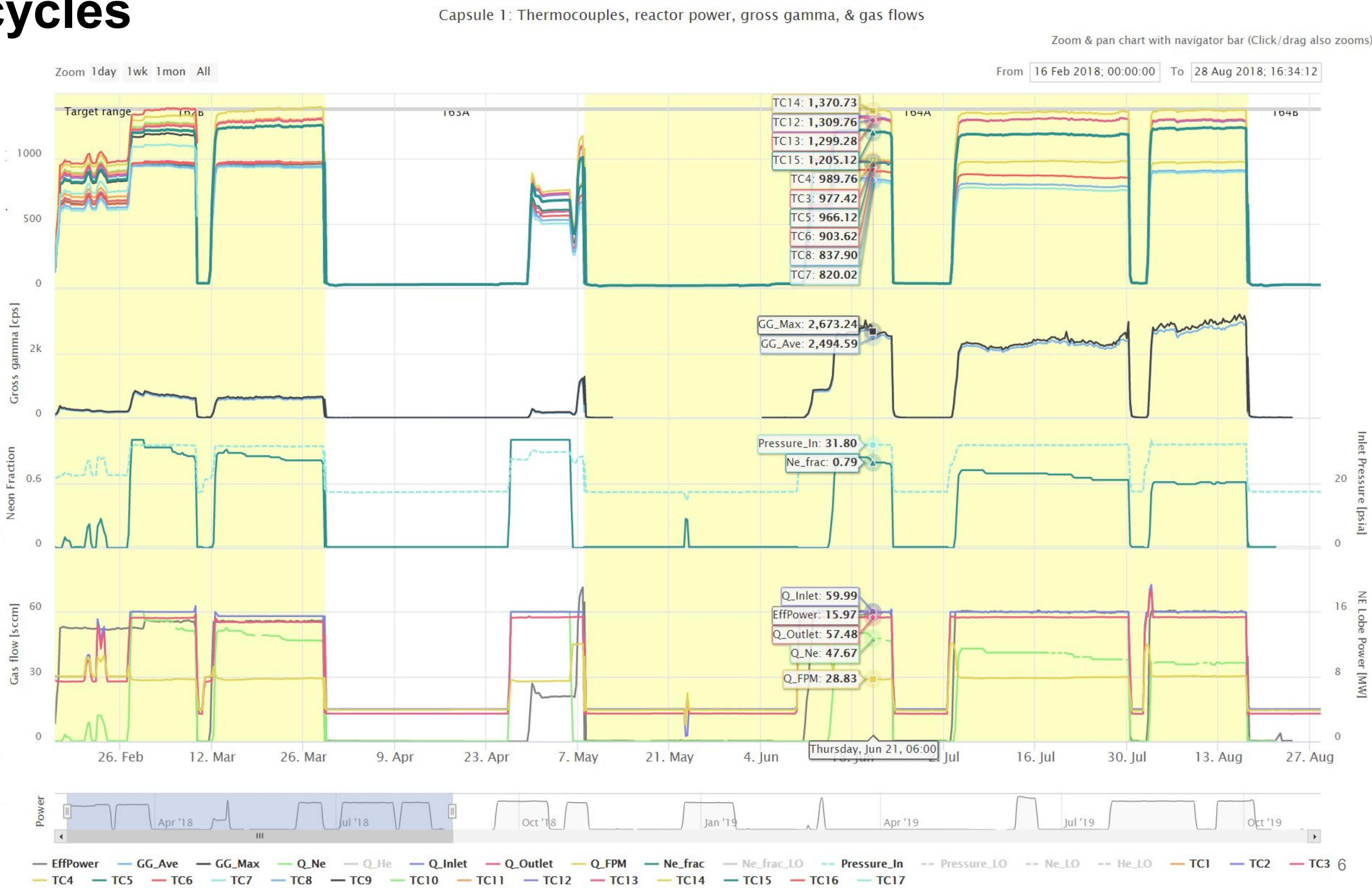
Simplified P&ID for capsule 1



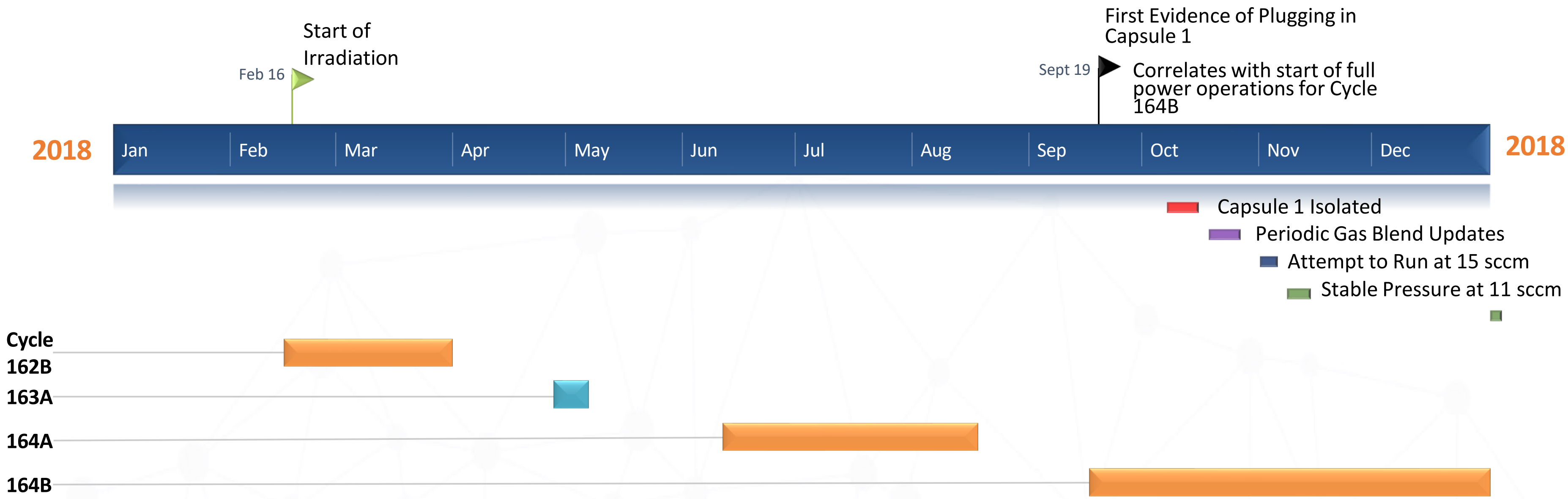
NORMAL OPERATION

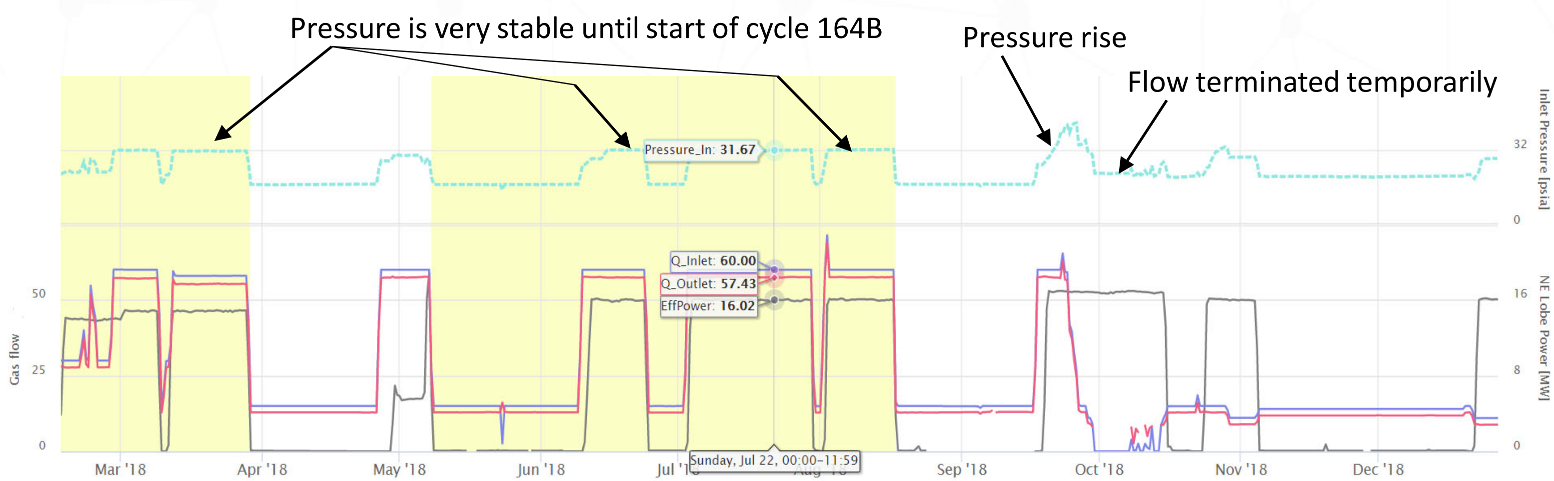
This mode of operation prevailed through cycle 164A (August 2018)

Capsule 1 performance is as expected for first three cycles

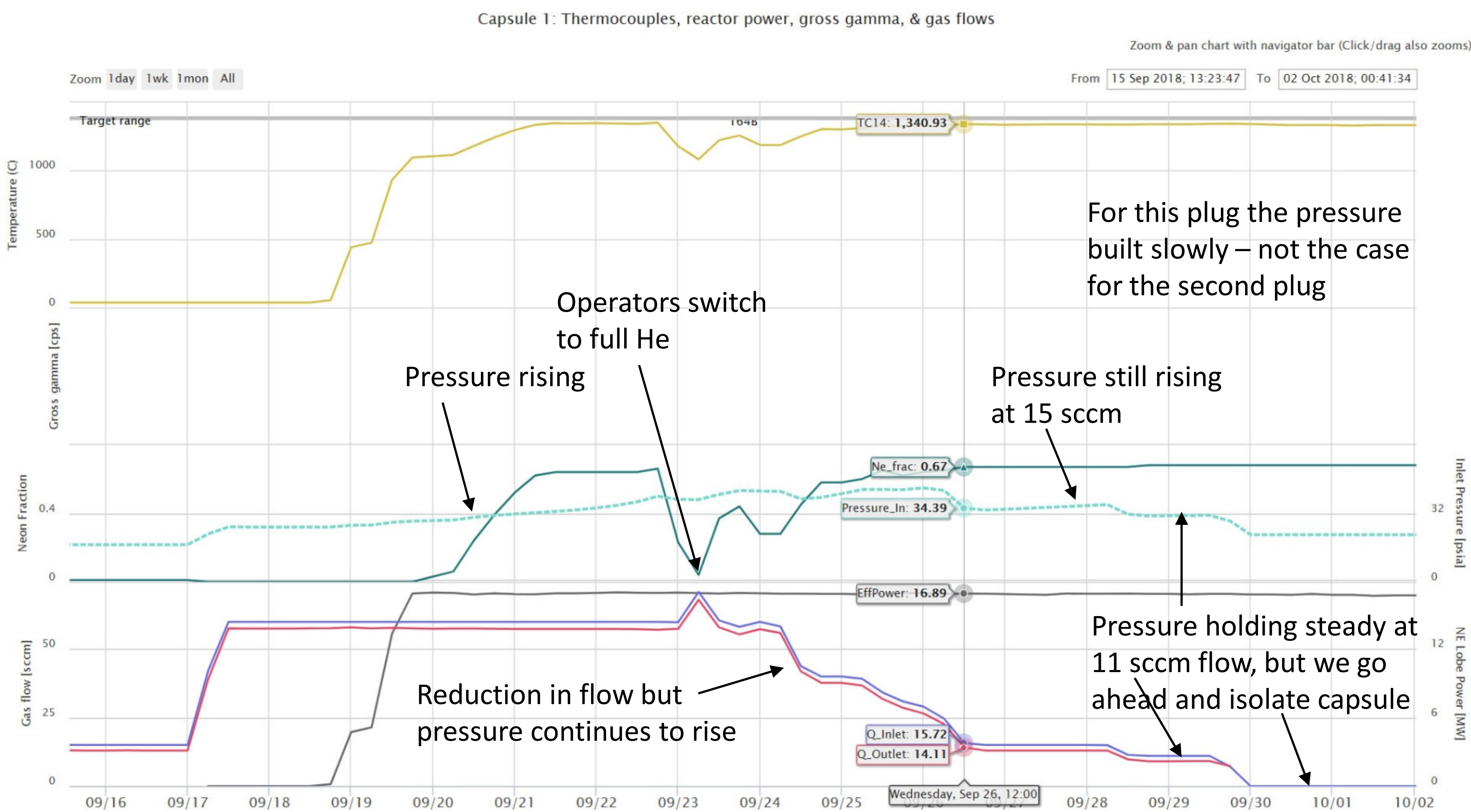


Capsule 1 CY2018 Irradiation Summary

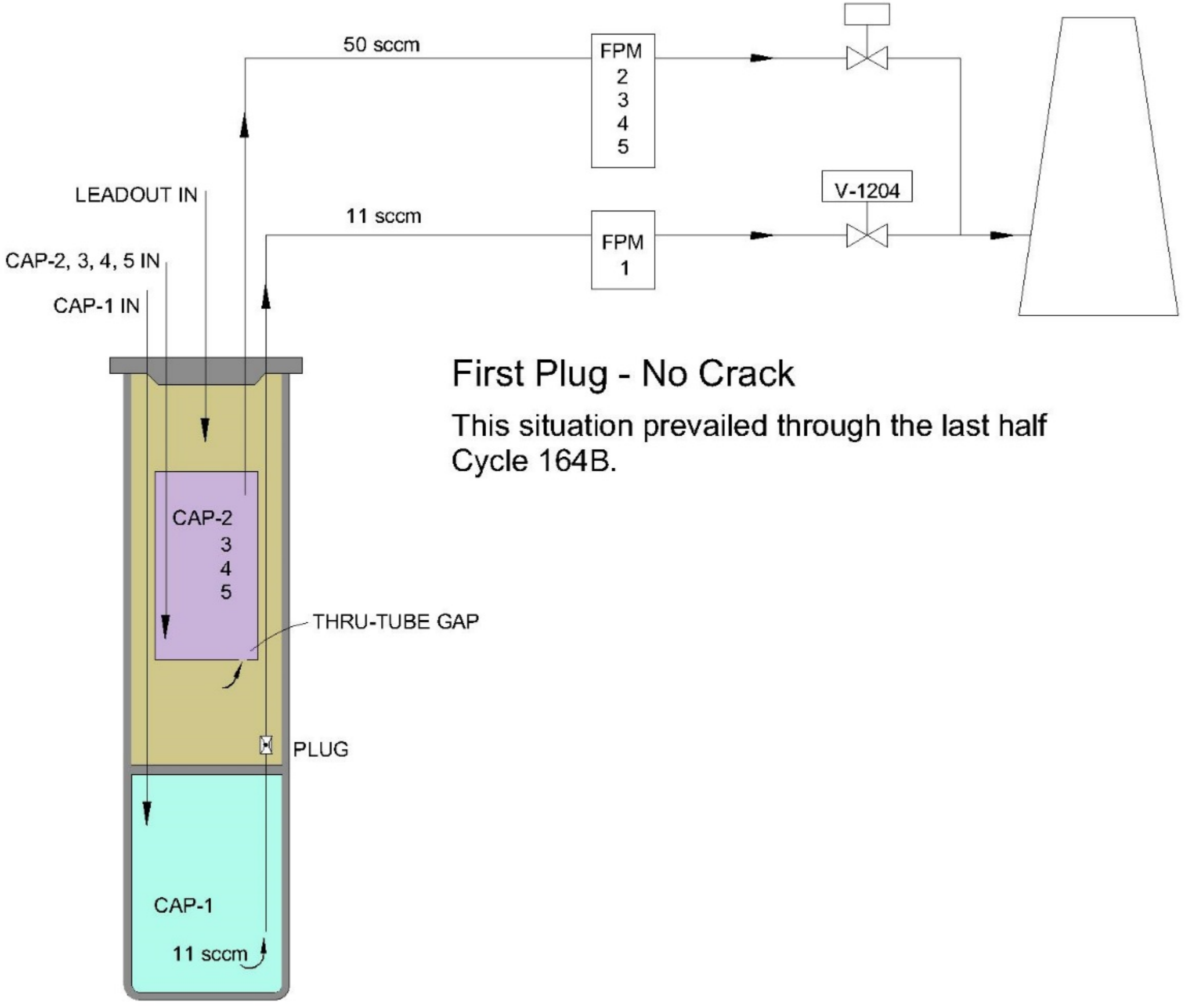




Details of capsule 1 first plug Sept 19 – Oct 2, 2018



Capsule 1 first plug – no crack



First Plug - No Crack

This situation prevailed through the last half Cycle 164B.

Why did a plug appear in capsule 1?

- We assumed the plug was in the exhaust line and later actions (swapping of lines) confirmed this
- The quantity of fission products released is several orders of magnitude too small to occlude the line
- The best candidate is the resin binder from the neolube which was painted on the interior of the inner capsule surfaces to increase the radiant heat transfer between the graphite holders and capsule walls
- We have used neolube in the previous AGR experiments, but not in such large quantities

ADVANCED REACTOR TECHNOLOGIES

An imprecise description of neolube

SERVICES (SIS)

908-788-5550

by Adaptas Solutions

Neolube

Hover to zoom

Price: $34.00

Part # 789003

Neolube

Quantity (EA) 1 Add to Cart

15 IN STOCK

- Description
- Features
- Specs

Description

Neolube is used to coat the threads on fittings to assure a smooth operation. Neolube is graphite dissolved in Isopropanol solvent. Within minutes of application the Isopropanol evaporates off leaving only graphite to lubricate the threads. No oils or other high boiling contaminants are present to contaminate vacuum of high purity systems.

Neolube No. 1 is a dry film, conductive lubricant, used in many applications as an anti-seize compound, thread lubricant and for lubricating moving parts and rubbing surfaces.

The composition of this material is 99% pure furnace graphite particles in Isopropanol. The material has excellent radiation resistance and high chemical purity. The thin, non corrosive film of Neolube 1 prevents seizing, frettign, galling and resists abrasion. It is easy to apply by spray, brush or dip and has excellent adhesion after a fast air dry. It does not migrate and it is non freezable. Neolube No 1 allows for easy assembly and non destructive disassembly. It has the properties which enable it to be used for lubrication in internal and external applications.

Features

- Graphite carbon in Isopropanol solvent
- Coat threads for smooth operation
- No oils or other high boiling contaminants

Specs

Physical Properties of Neolube	
Total Solids Content, weight percent	3.3% +/- 0.5%
Maximum particle dimension of 90% of particles	4 Microns
Maximum particle dimension of any particle	10 microns
Lubricant	Processed micro graphite
Binder	Thermoplastic resin
Dilutent	Isopropanol
Consistency	Thin liquid
Shelf life	No limit in closed container
Temperature range	-70 deg F - 400 deg F
Color	Black
Flash Point	52 deg F
Coeffecient of friction	0.030 - 0.090

Neolube is ideal to coat the threads for the desorption system. Needles and fittings go on much easier and no system contamination occurs.

ADVANCED REACTOR TECHNOLOGIES

A better description of neolube

Newman Tools Inc.

Supplying High Quality Tools and Supplies for Machine Shops, Plant Engineering and Maintenance since 1955

Tel 1-800-465-1384 Fax 1-800-605-2442

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Neolube No.1 Lubricant

MSDS

TECHNICAL INFORMATION SHEET

NEOLUBE NO. 1 LUBRICANT - COLLOIDAL GRAPHITE IN ISOPROPANOL

APPLICATION: NUCLEAR POWER GENERATING PLANTS, NUCLEAR REACTORS, COMMERCIAL AND NAVAL

Neolube No. 1 is a dry film, conductive lubricant, used extensively at nuclear power generating plants and other nuclear facilities as an anti-seize compound, thread lubricant and for lubricating moving parts and rubbing surfaces.

The composition of this material is 99% pure furnace graphite particles, a thermoplastic resin and isopropanol. The material has excellent radiation resistance and high chemical purity. The thin, non-corrosive film of **Neolube No. 1** prevents seizing, fretting, galling and resists abrasion. It is easy to apply by spray, dip or brush and has excellent adhesion after a fast air dry. The dry film of **Neolube No. 1** will not migrate and it is non freezable.

Neolube No. 1 has satisfied the stringent requirements for lubricating the internal and auxiliary equipment mechanisms of commercial and naval nuclear reactor systems. **Neolube No. 1** allows easy assembly, trouble-free operation and non-destructive disassembly. **Neolube No. 1** provides non corrosive, dry adherent lubrication for metal parts with limited clearances in applications were control of impurities is required.

Neolube No. 1 is ***NOT RECOMMENDED FOR LUBRICATING THREADS IN THE REACTOR PRIMARY CONTAINMENT AREAS***, where operating temperatures for the fittings are greater than 400°F. Neolube No. 1260 is recommended for use in containment and/or secondary side in nuclear applications.

A Certificate of Quality Conformance and Analysis is available for each lot upon request.

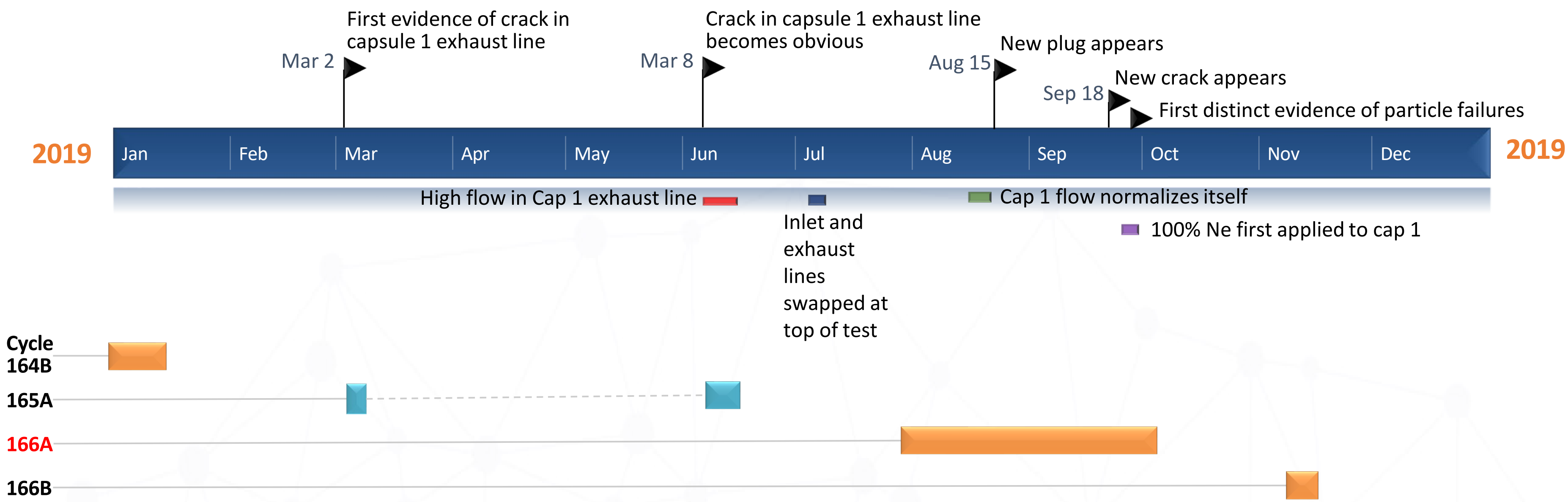
Neolube No. 1 has been used successfully in applications where it has withstood radiation levels of 1 x 10^9 rads.

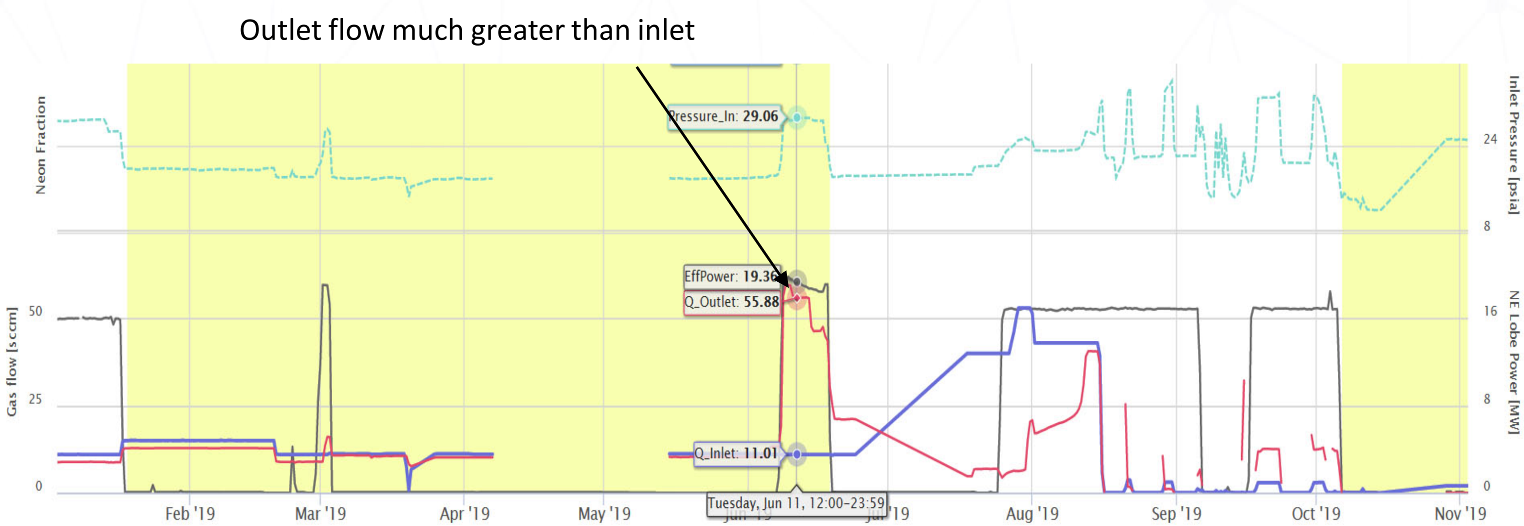
Physical and Chemical Equirements	**MIL-L-24131C**
Total Solids Content, weight percent	3.3% +/- 0.50%
Graphite Content, percent of total solids	75% +/- 5%

25% of the solids is apparently the resin binder

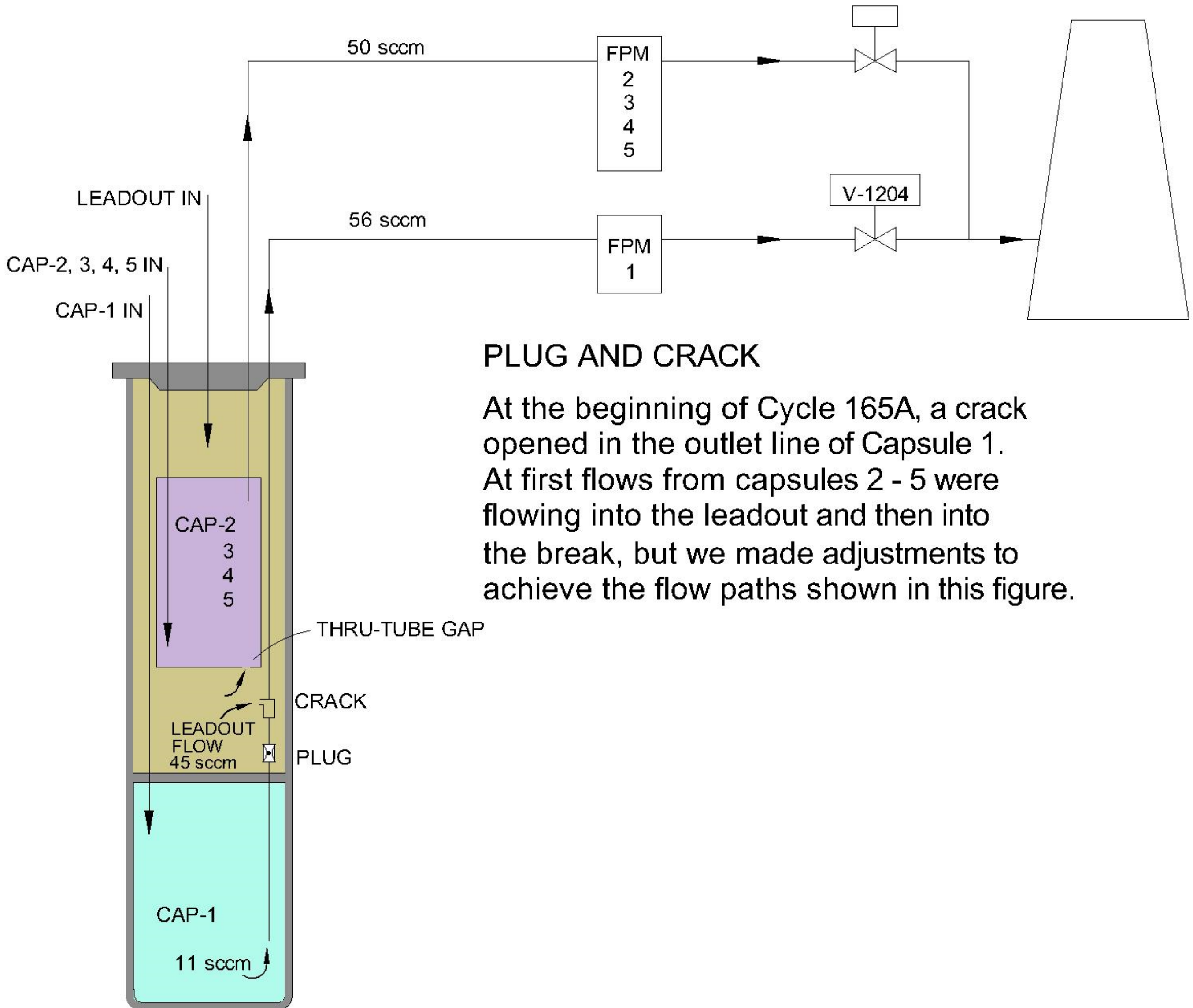
Calculations indicate this is plenty of material to plug a .032" diameter hole (ID of gas lines in core region)

Capsule 1 CY2019 Irradiation Summary





Capsule 1 plug and crack



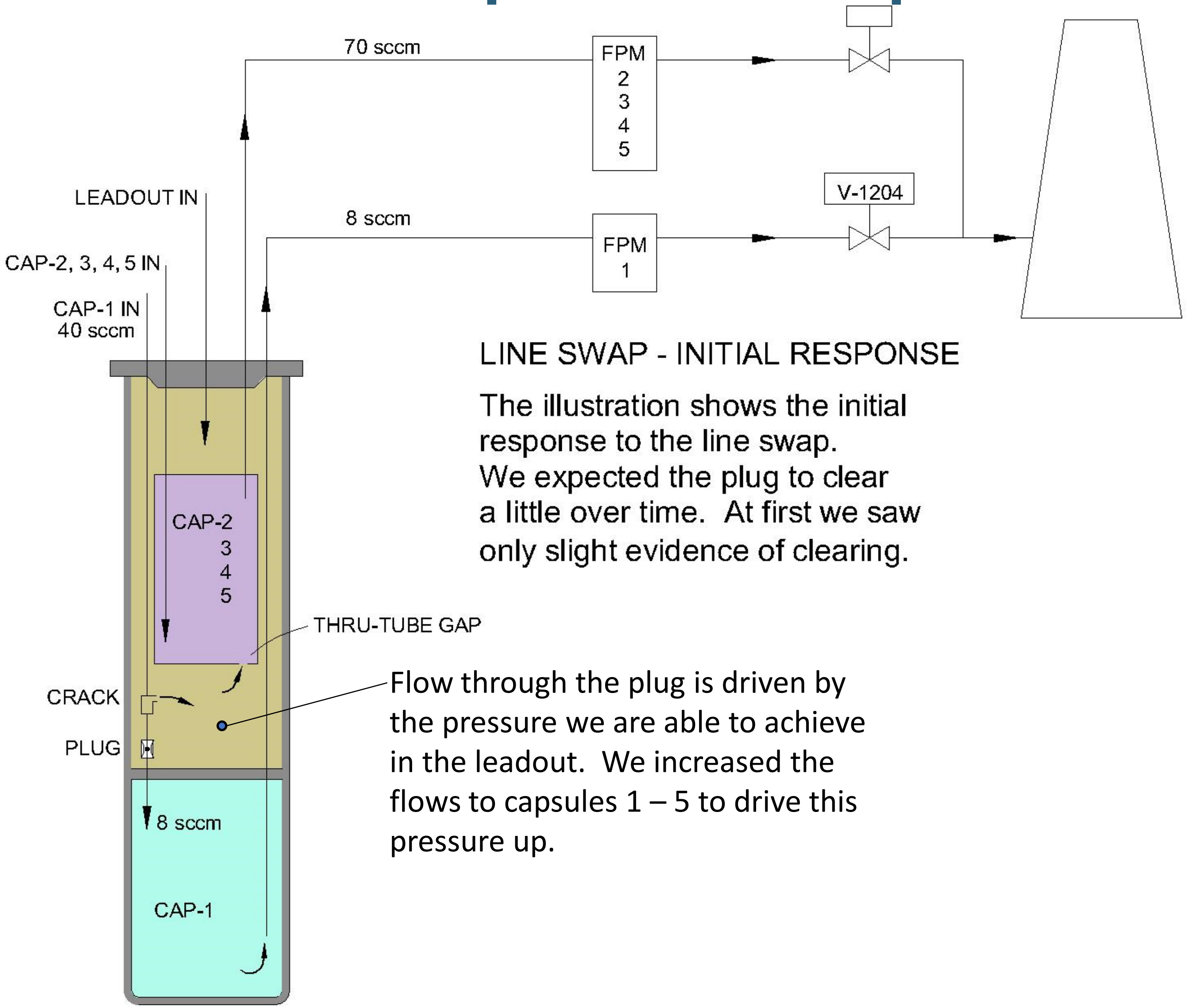
PLUG AND CRACK

At the beginning of Cycle 165A, a crack opened in the outlet line of Capsule 1. At first flows from capsules 2 - 5 were flowing into the leadout and then into the break, but we made adjustments to achieve the flow paths shown in this figure.

Reason for line swap

- We were concerned that the dilution gas from the leadout would make interpretation of fission product measurements for capsule 1 difficult.
- We decided to swap the inlet and outlet lines for capsule 1 at the top of the test.
- This would ensure that whatever we read on channel 1 of the Fission Product Monitoring System (FPMS) had actually come from capsule 1 and at a known flow rate.
- The eventual results of the line swap were quite surprising – first elation, followed by stark disappointment.

Capsule 1 line swap – initial response

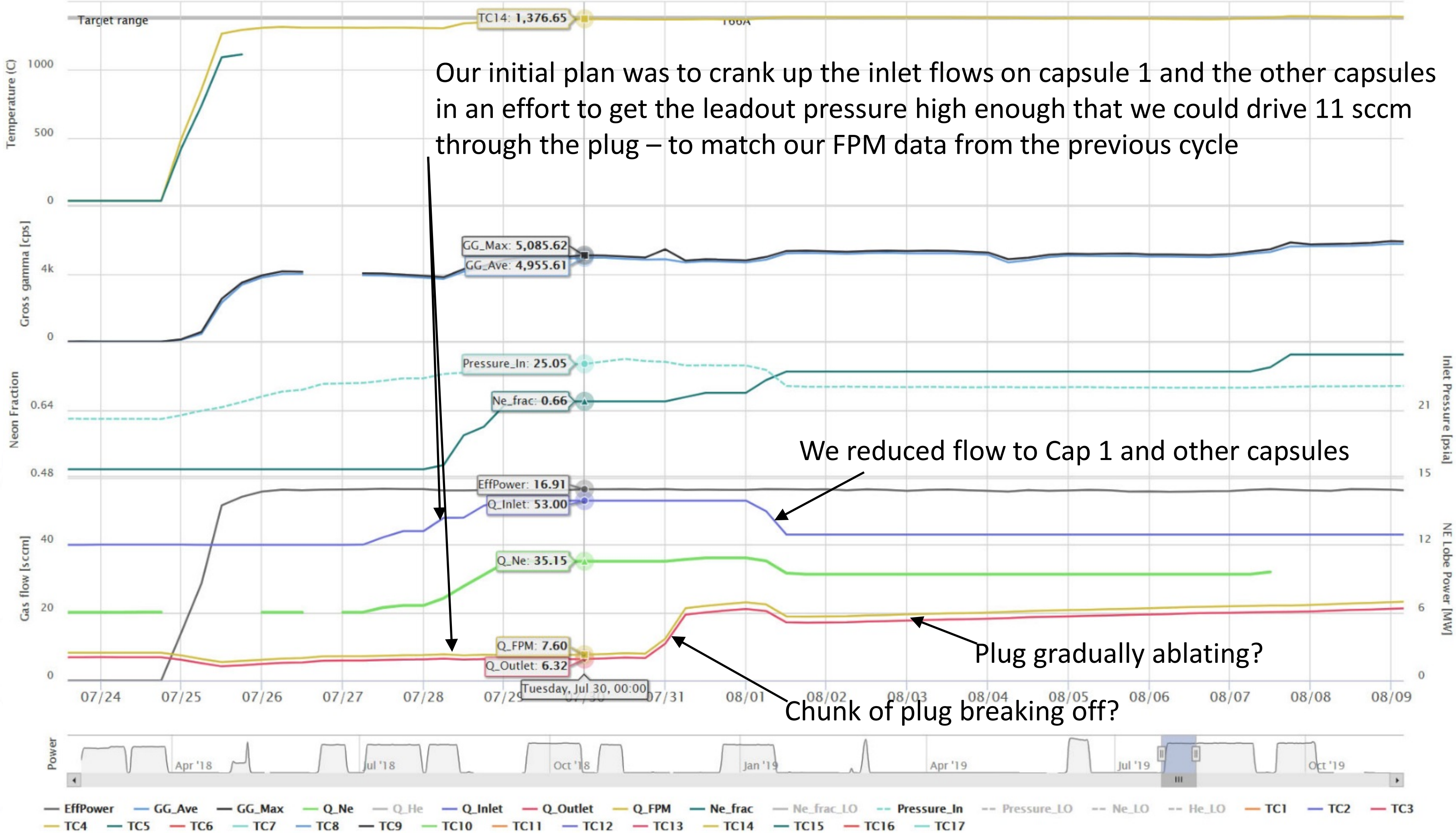


LINE SWAP - INITIAL RESPONSE

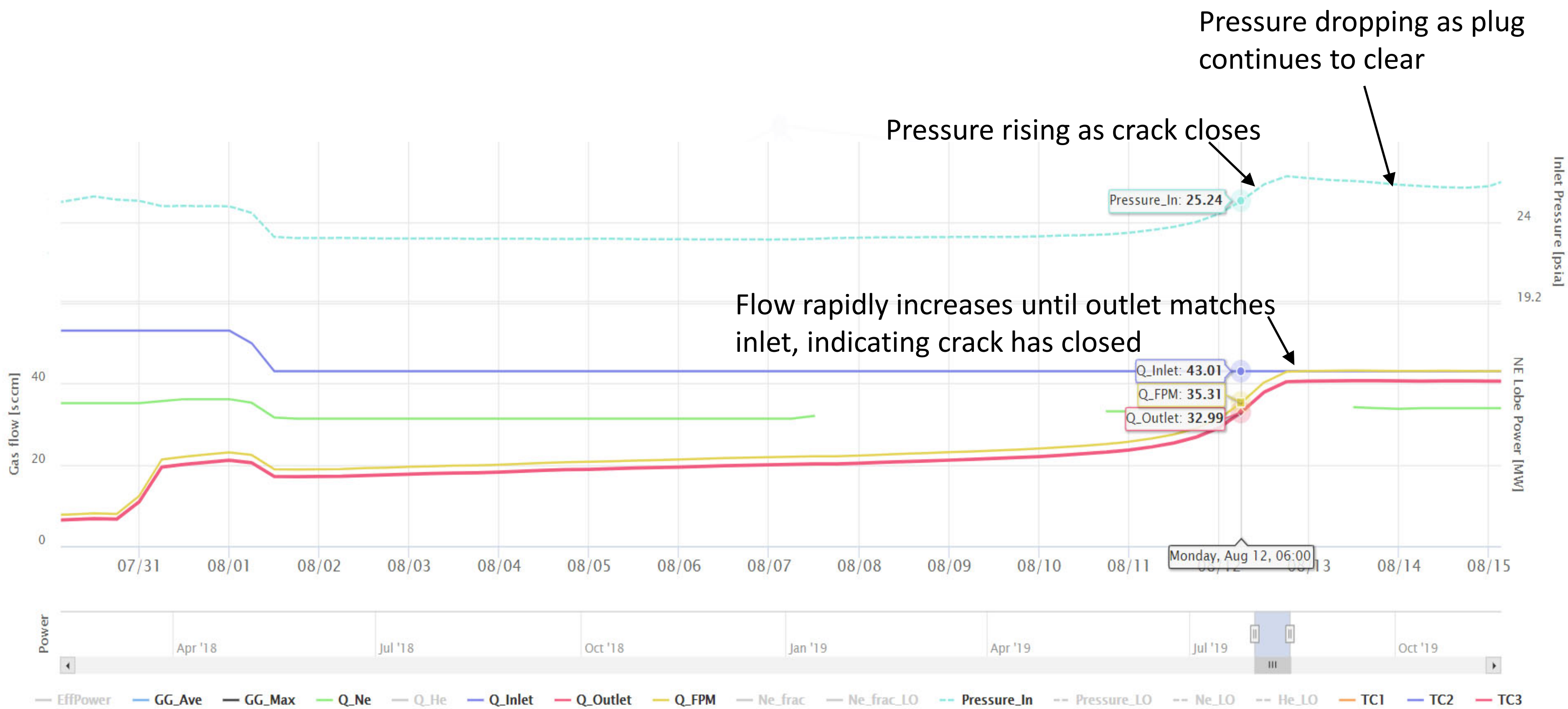
The illustration shows the initial response to the line swap. We expected the plug to clear a little over time. At first we saw only slight evidence of clearing.

Flow through the plug is driven by the pressure we are able to achieve in the leadout. We increased the flows to capsules 1 – 5 to drive this pressure up.

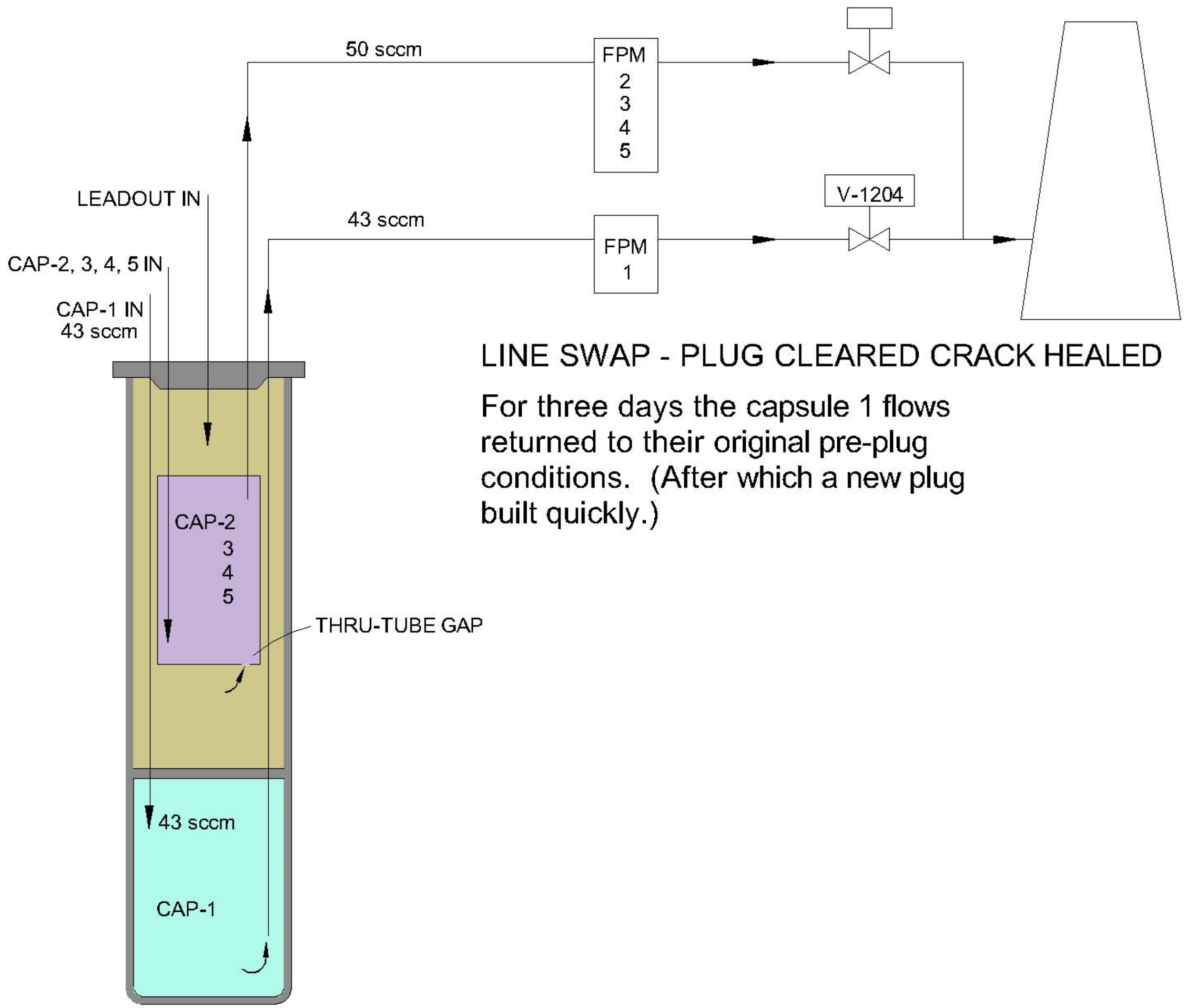
Line swap initial response July 24 – Aug 9, 2019



Line swap: plug clears, crack heals Aug 10 - 15, 2019



Capsule 1 line swap – plug cleared, crack closed



LINE SWAP - PLUG CLEARED CRACK HEALED

For three days the capsule 1 flows returned to their original pre-plug conditions. (After which a new plug built quickly.)

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AGR-5/6/7 Temperature Perfomance as of End of Cycle 166A

Technical Coordination Team

November 11, 2019

Joe Palmer

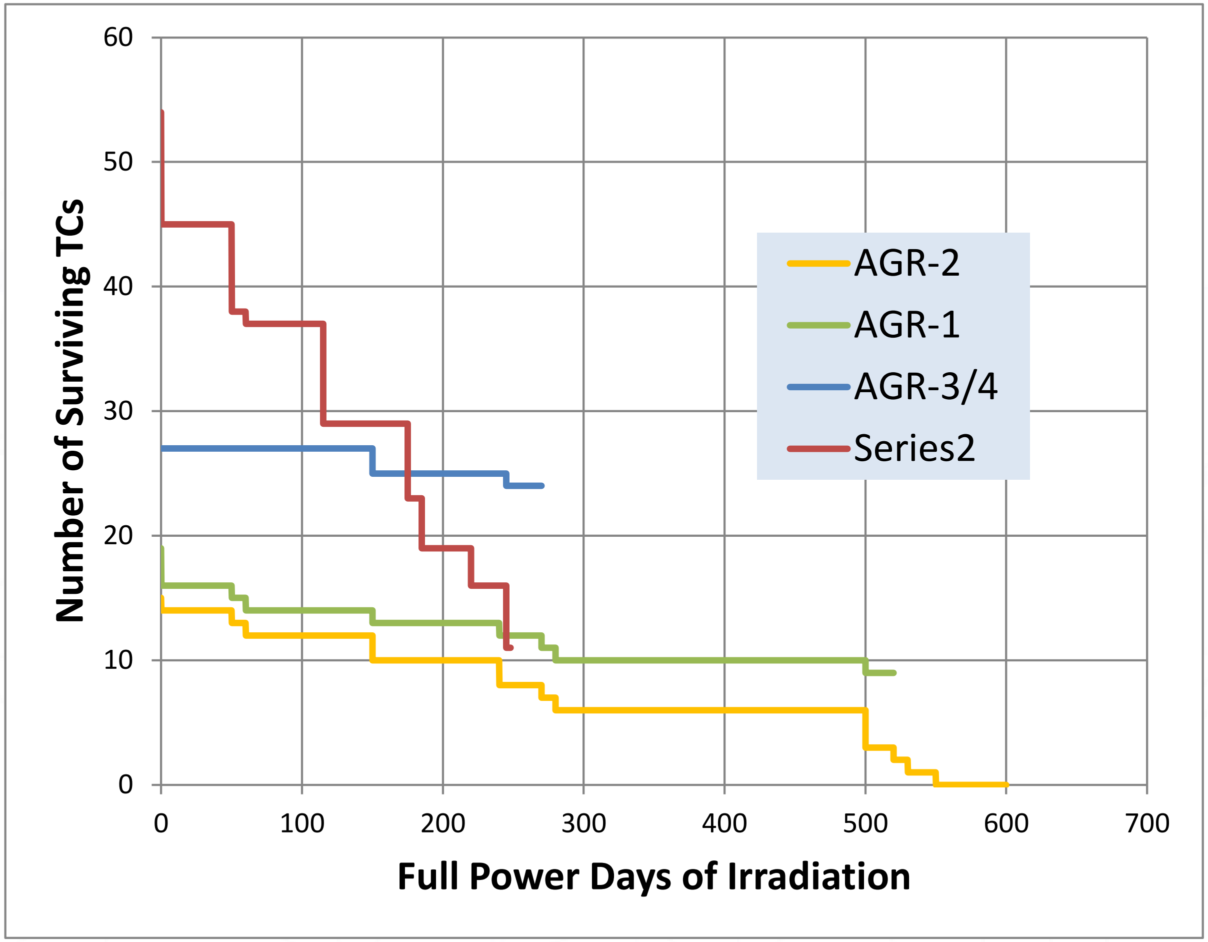
Mechanical Engineer, PE

ADVANCED REACTOR TECHNOLOGIES

Thermocouple Performance

Survivors by Capsule/Type		End of Assem	End of Install	End of 162B	End of 163A	End of 164A	End of 164B	End of 165A	End of 166A
Cap 5	STD	4	3	3	3	3	3	3	3
Cap 4	STD	5	4	4	4	4	4	4	4
Cap 3	STD	4	4	4	4	4	4	3	3
	CAMB	7	5	5	5	2	2	2	1
	HTIR	4	4	3	3	3	3	3	0
Cap 2	STD	8	8	8	8	6	3	2	0
Cap 1	STD	1	1	1	0	0	0	0	0
	CAMB	7	7	6	6	3	1	0	0
	HTIR	9	9	4	4	4	3	2	0
Total Surviving		49	45	38	37	29	23	19	11

AGR-5/6/7 TC Performance Compared to Past AGR Tests



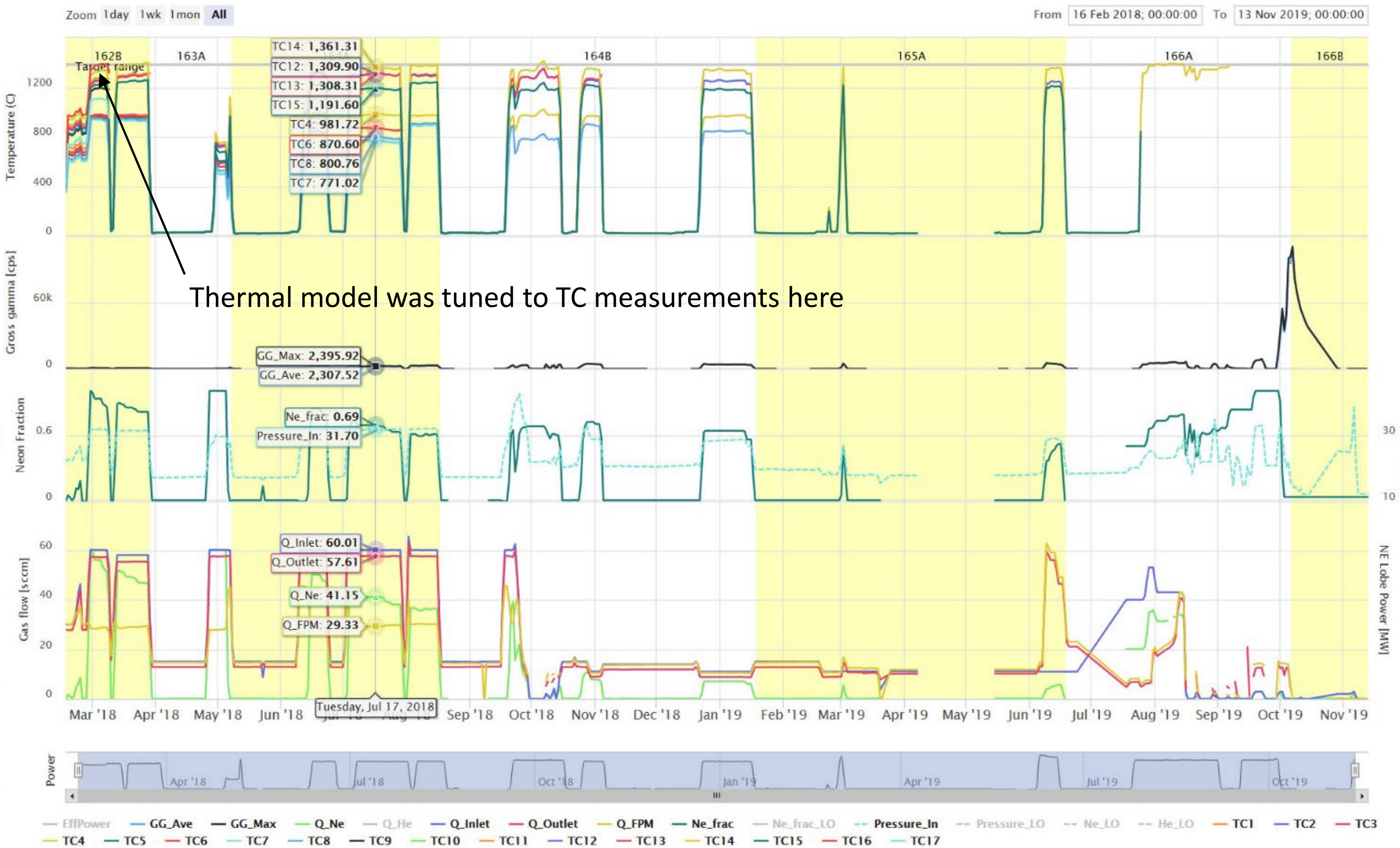
Thermocouple Performance (cont)

- The AGR-5/6/7 thermocouple failure rate has been high
- Nearly all of the hot and “deep” thermocouples have failed so the failure rate should markedly decrease.
- AGR-1 and AGR-2 also experienced high failure rates with 3 of the 6 capsules in each experiment having no functioning thermocouples for more than half of the irradiation period.

Thermal modelling

- The thermal model is “tuned” to the thermocouples during the early part of the first cycle
- It is done at this time based on the assumption that the thermocouples should be essentially drift free at this point

Capsule 1 measured temperatures throughout irradiation

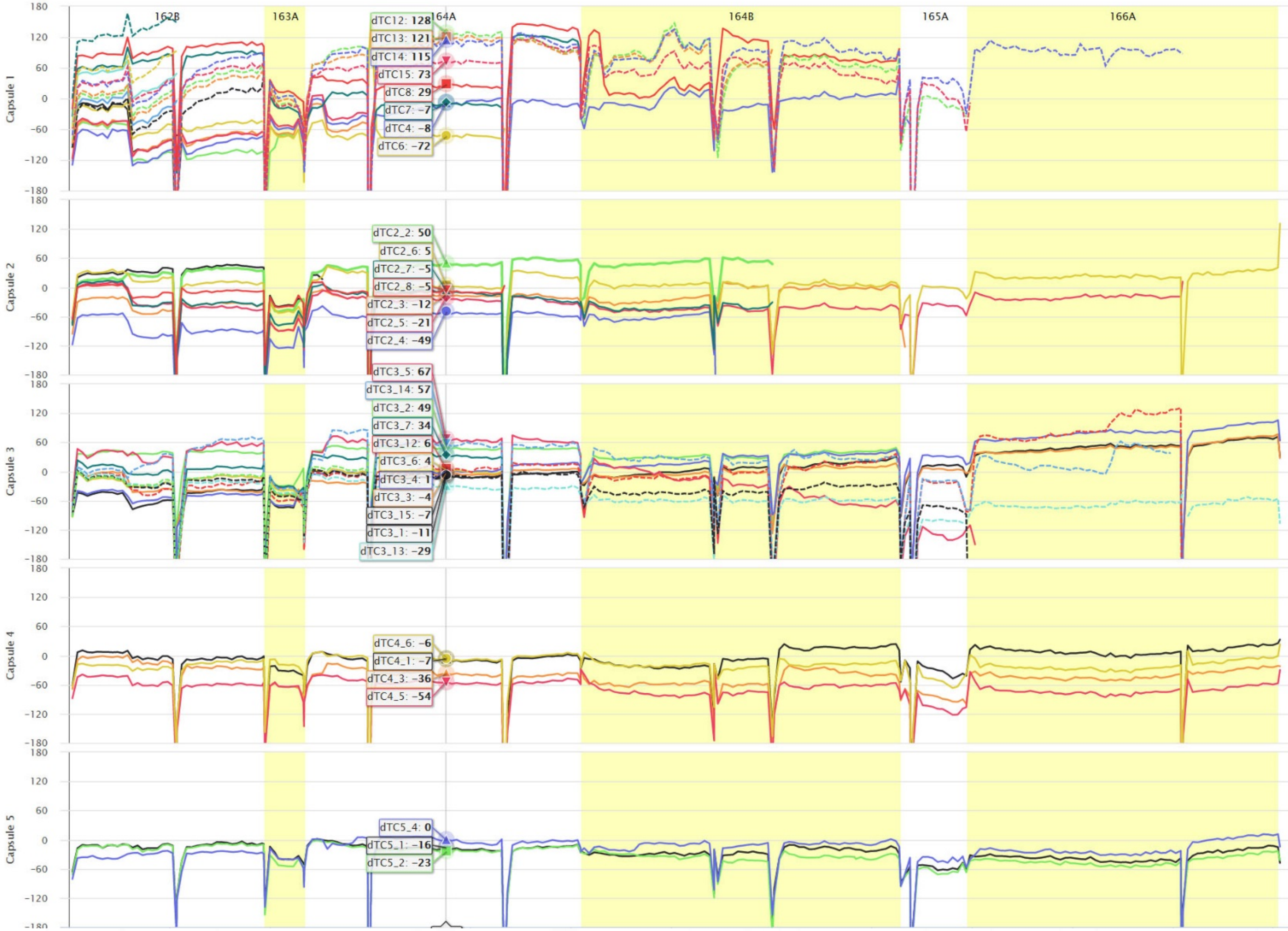


ADVANCED REACTOR TECHNOLOGIES

Thermal model tuning – primary parameters

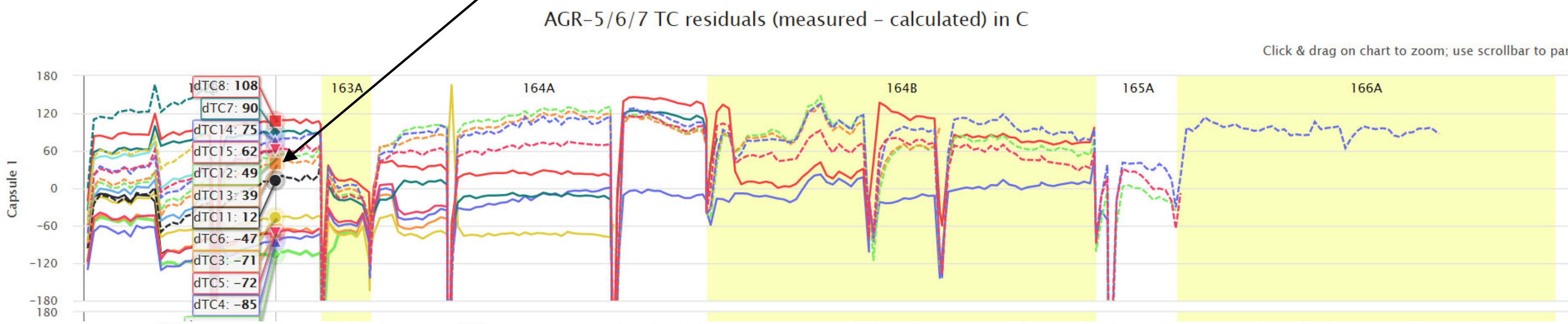
- Gas gap thickness – via neolube thickness
- Graphite conductivity
- Emissivity (for radiant heat transfer)
- We did look at the effects of fuel and holders being off-centered, but it was not a major factor
- These parameters were tuned only within defendable ranges
- Tuning adjustments were made consistent capsule to capsule
- Tuning adjustments were kept consistent cycle to cycle

All capsules measured - calculated (residuals)

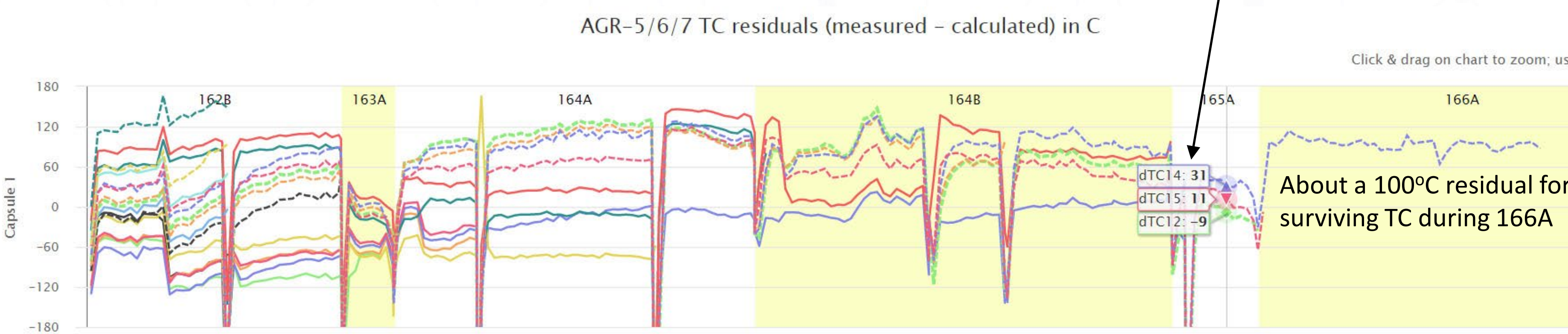


Capsule 1 measured - calculated entire test period

Fairly even distribution of residuals this first cycle

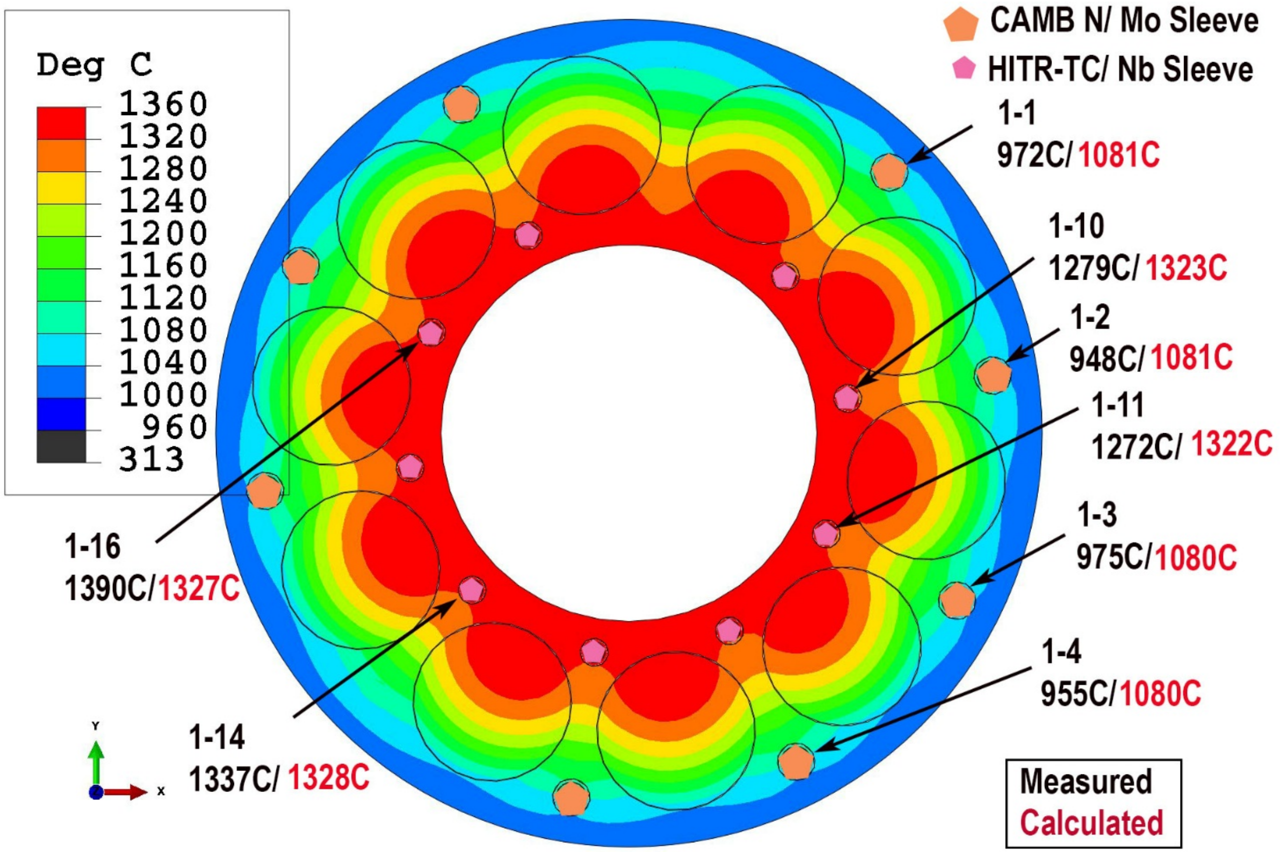


Remarkably small residuals during high power PALM cycle

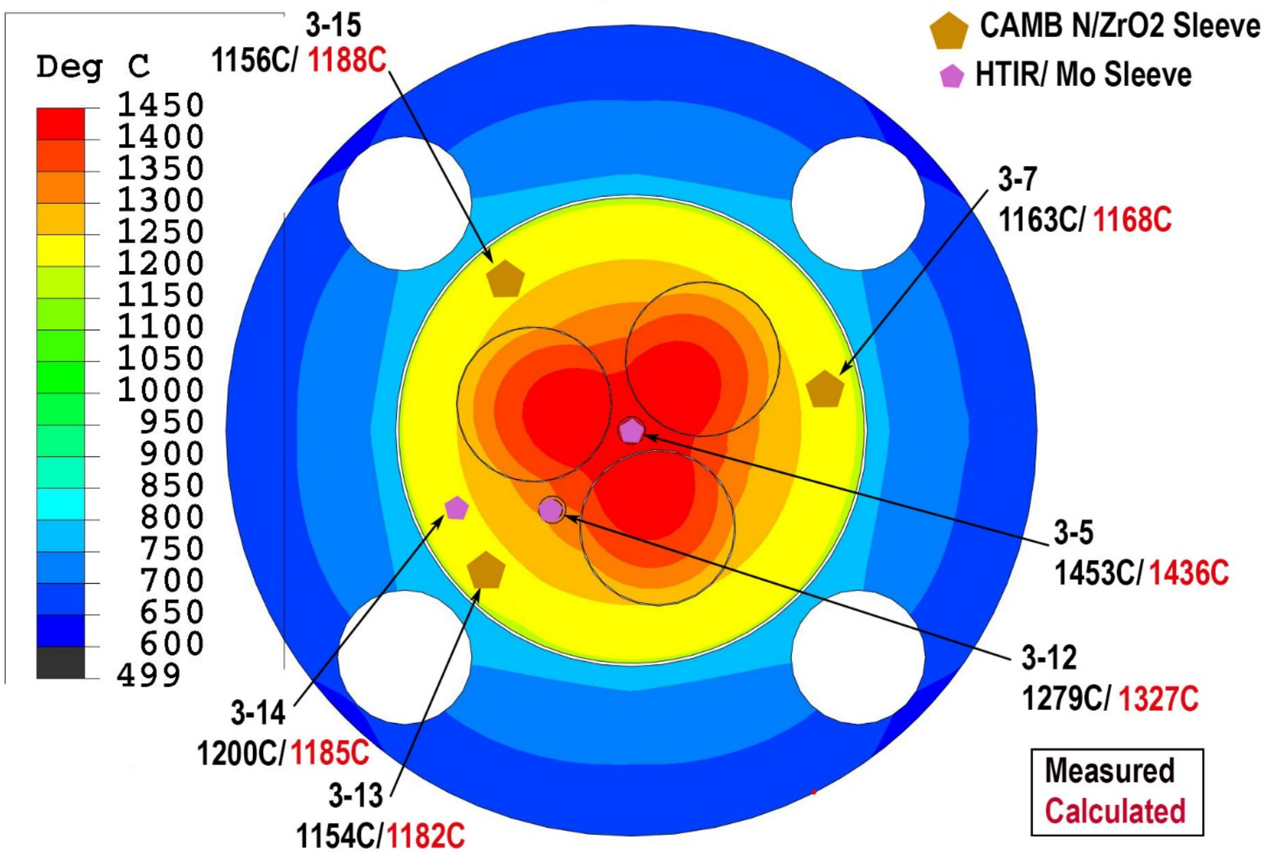


About a 100ºC residual for surviving TC during 166A

Capsule 1 measured vs calculated – early in first cycle



Capsule 3 thermocouples measured vs calculated early in first cycle



Consistent discrepancy between residuals of outboard vs inboard thermocouples in capsule 1 implies lower conductivity of graphite perhaps

- This conductivity was lowered as much as possible consistent with the literature
- An even lower graphite conductivity might improve capsule 1 residuals slightly, but would increase residuals for other capsules
- Capsule 1 inboard thermocouples consistently read 60 – 100^{o}C higher than the model predicts. Therefore the time averaged particle temperature distribution could be considerably underpredicted

Particle Temp Requirements from AGR-5/6/7 “Technical and Function Requirements Document” (TFR)

Table 1. Fuel Particle Temperature Distribution.

AGR-5/6	
Desired fraction of particles per temperature range	Number of Particles Based on 500,000 total
30% <900°C	150,000
30% 900°C - 1050°C	150,000
30% 1050°C - 1250°C	150,000
10% 1250°C - 1350°C	50,000
Total	500,000
AGR-7	
Temperature Range	Minimum Number of Particles
1350°C - 1500°C	50,000

Table 1 represents a goal particle distribution. It is not expected that it will be achieved exactly. Additional temperature requirements are as follows:

a) AGR-5/6 time average minimum temperature ≤ 700°C

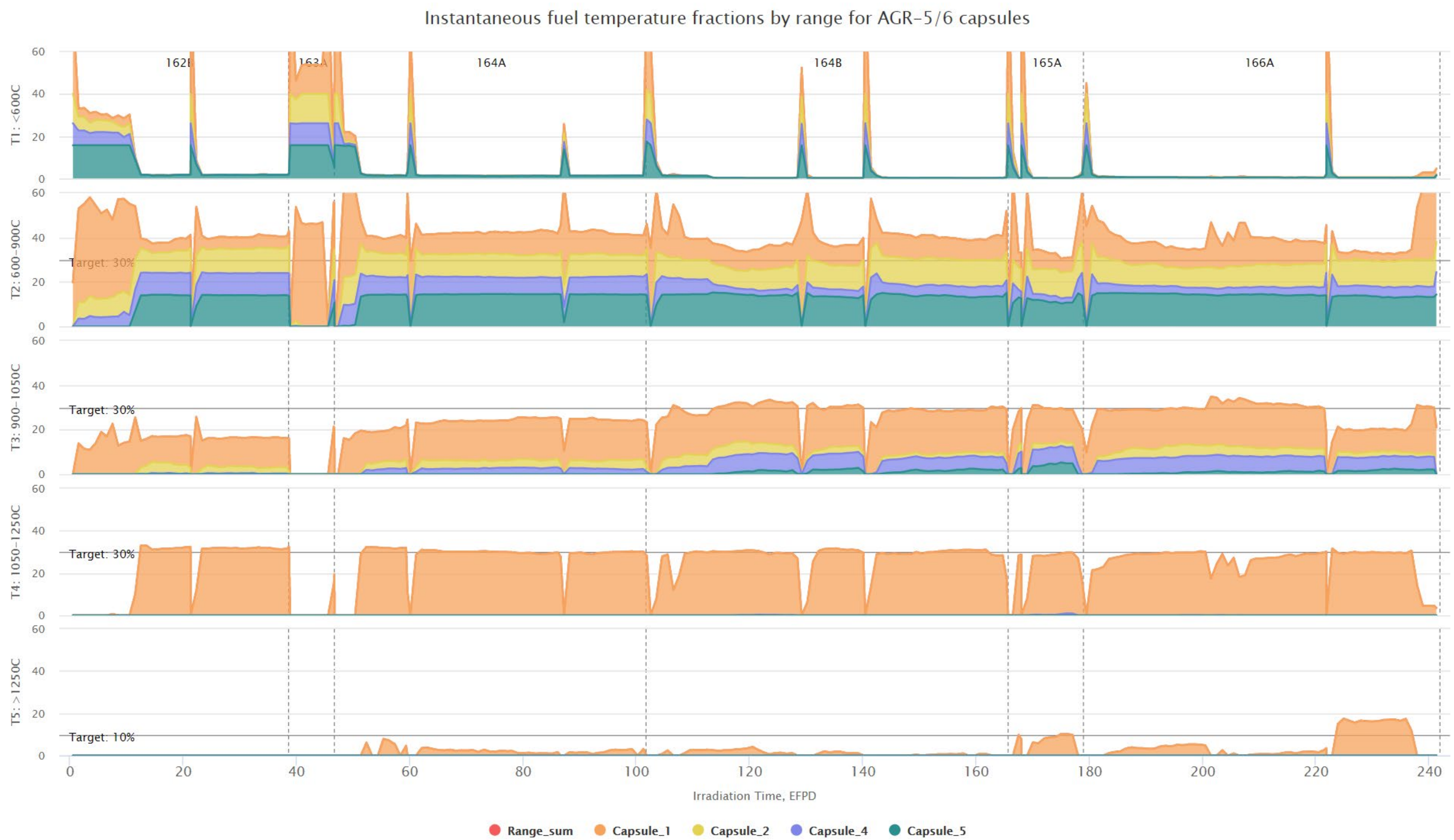
b) AGR-5/6 time average, peak temperature 1350 ± 50°C

c) AGR-7 time average, peak temperature 1500 ± 50°C.

Excerpt from AGR-5/6/7 “Test Plan”

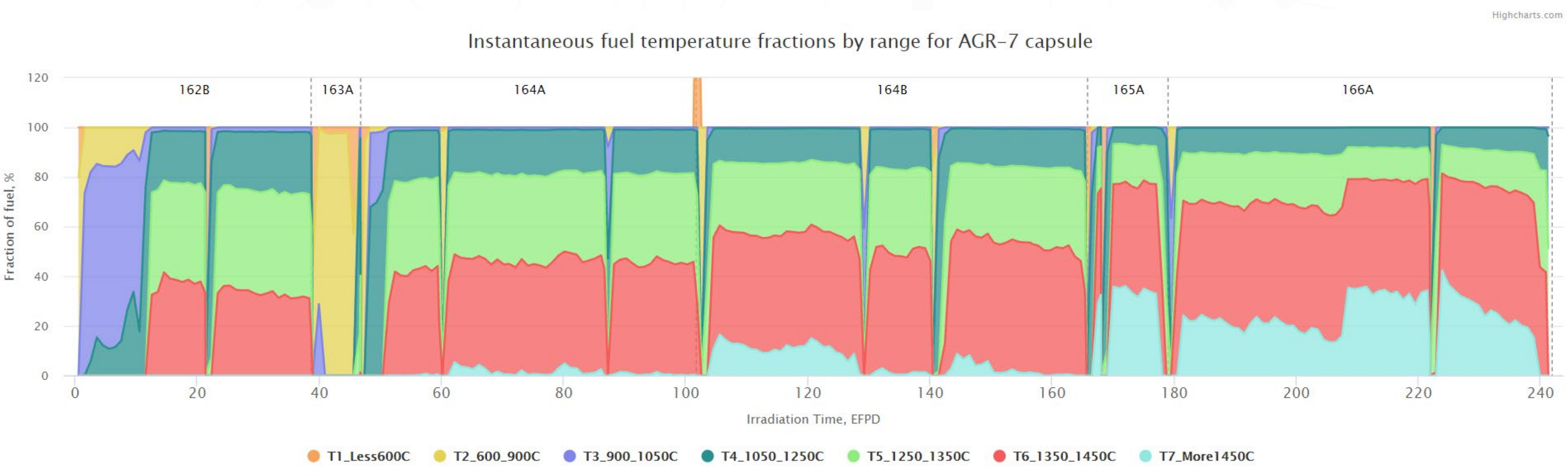
- Since AGR-7 is designed as a margin test of the UCO fuel, a dominant fuel performance parameter for this test is time at temperature. Considering AGR-2 tested UCO fuel at a time-average peak temperature of 1360°C with online data indicating no deleterious effects (Collin, 2014), AGR-7 will be tested at a higher peak temperature of 1500°C and the majority of the ~50,000 particles will operate above 1350°C.
- In both AGR-5/6 and AGR-7, an instantaneous peak temperature specification of ≤1800°C will provide an operational limit to minimize overheating of the fuel.
- The time-average peak temperature of AGR-5/6 is required to be 1350 ± 50°C, while the time-average peak temperature of AGR-7 should be 1500 ± 50°C. Furthermore, the AGR-5/6 test specifications require the time-average minimum temperature to be less than 700°C,

Instantaneous AGR-5/6 Fuel Temperature Distribution

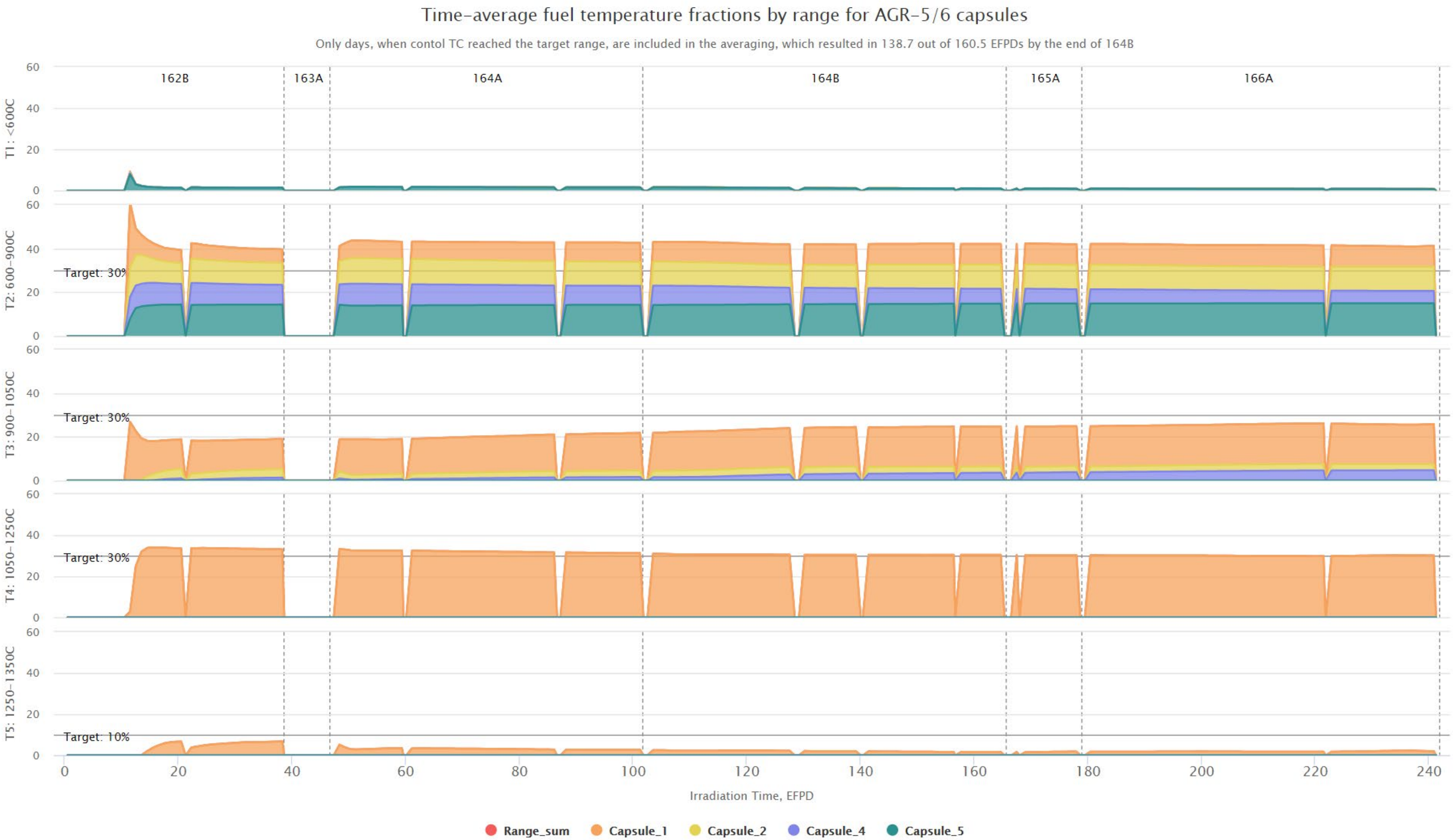


Peak fuel temperatures had been drifting down (prior to 165A PALM cycle). We increased TC set points for Cycle 166A on capsules 1, 2, 3.

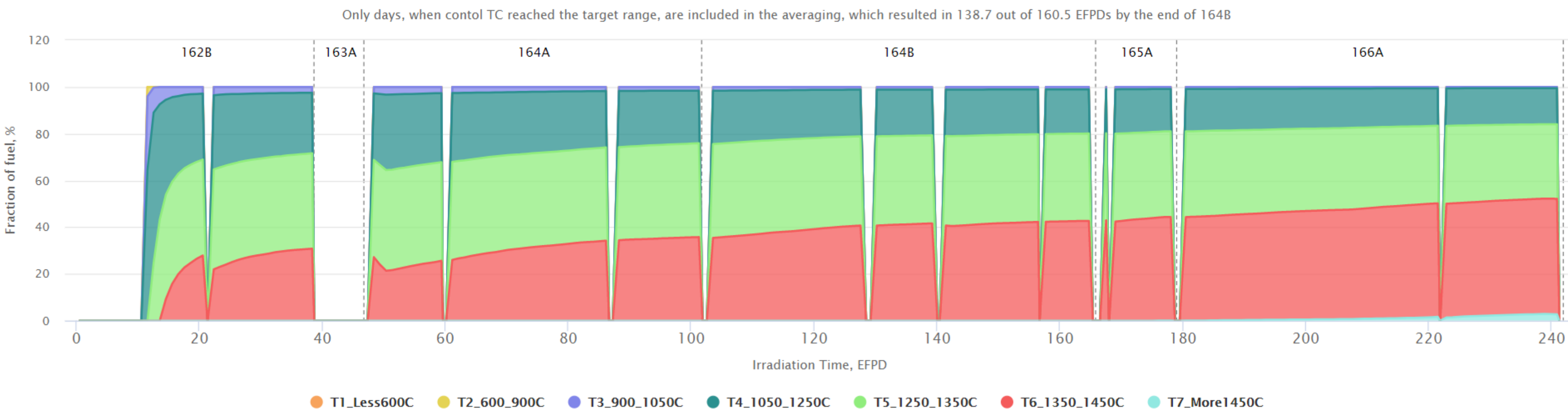
Instantaneous AGR-7 Fuel Temperature Distribution



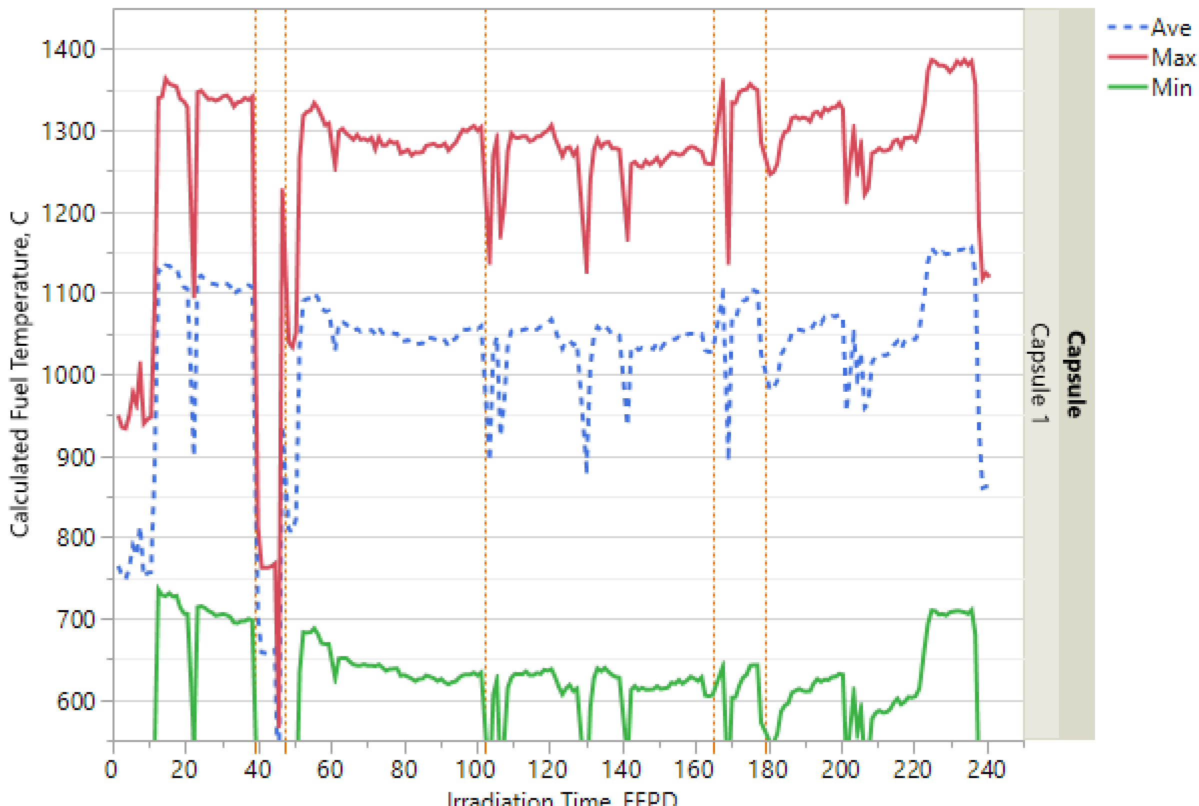
T-Avg V-Avg AGR-5/6 Fuel Temperature Distribution



T-Avg V-Avg AGR-7 Fuel Temperature Distribution

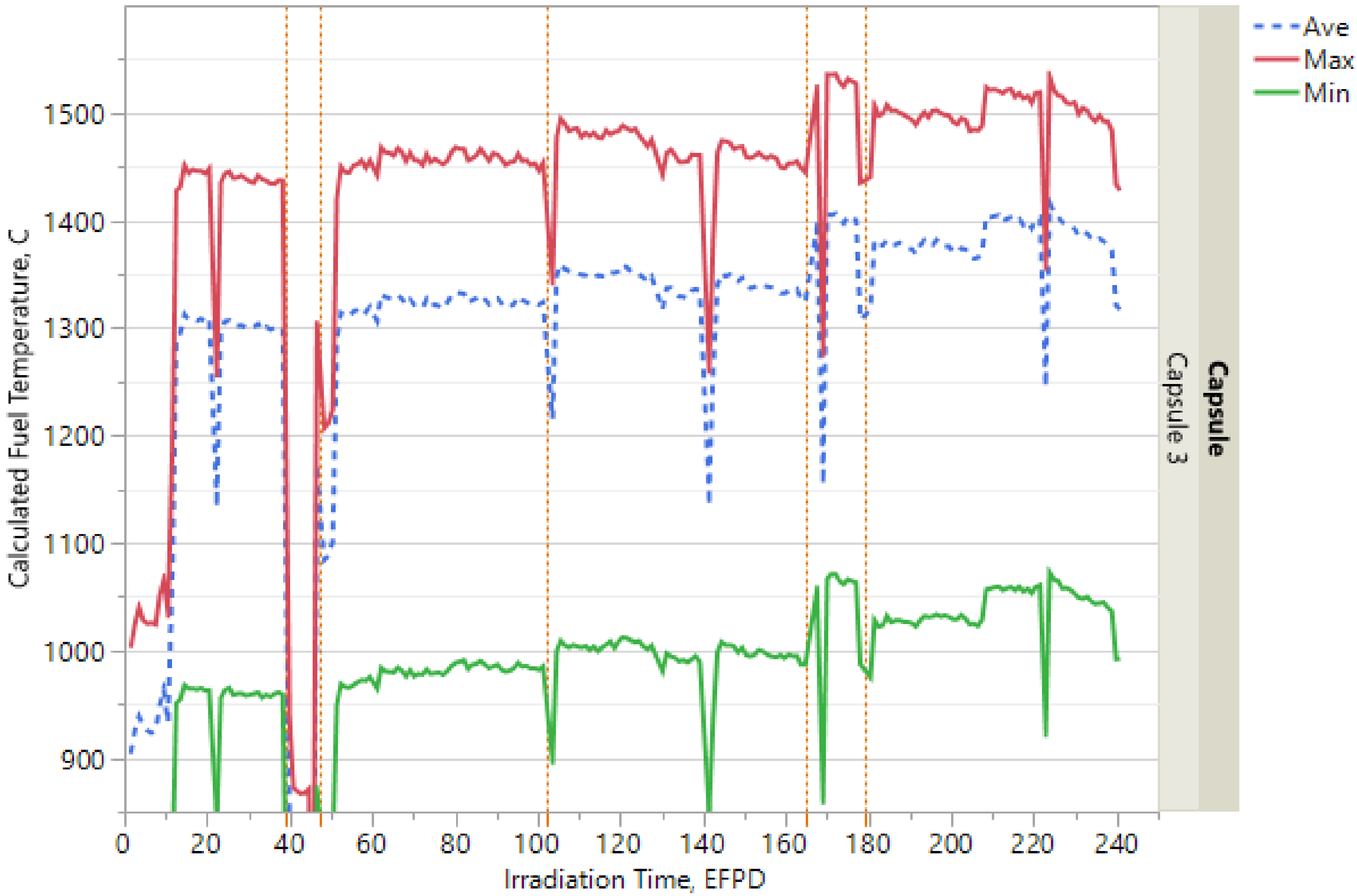


Capsule 1 peak and avg fuel temperatures (calculated)

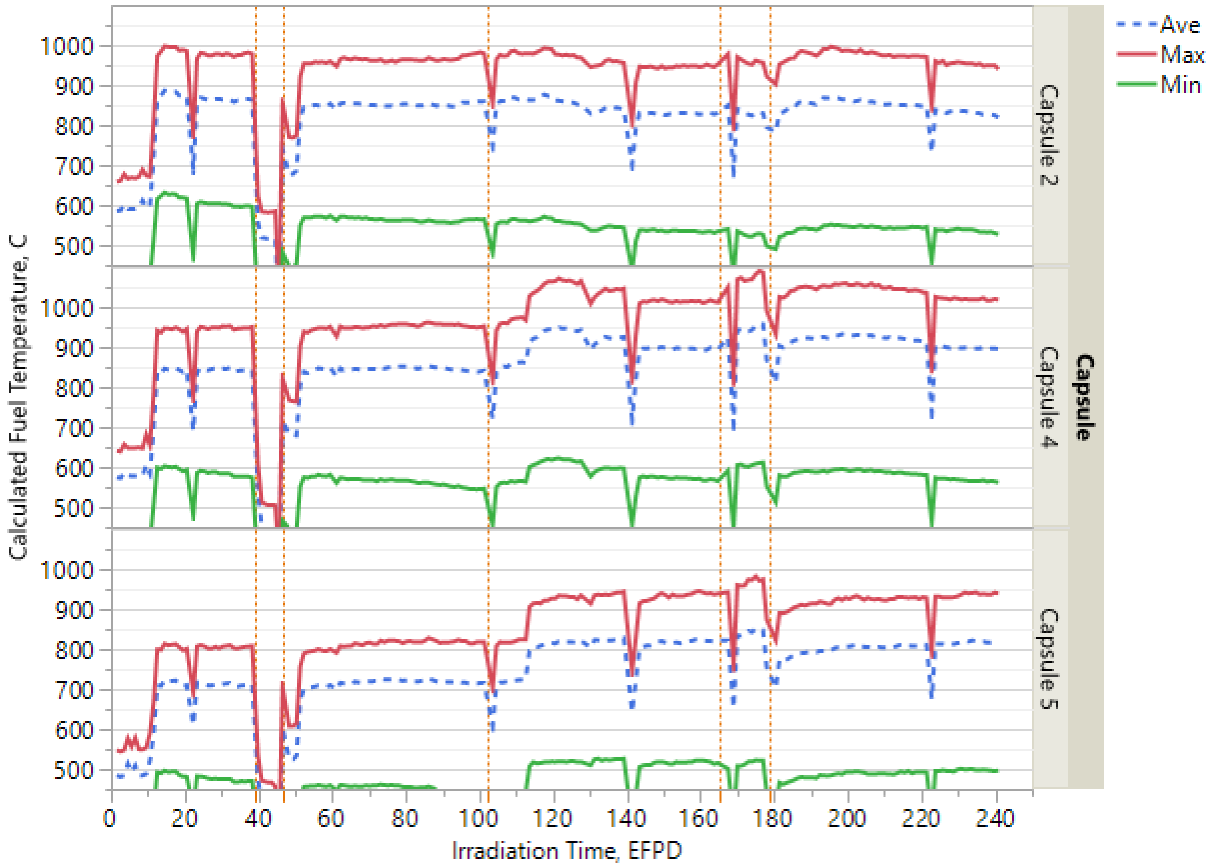


Capsule 1 inboard thermocouples consistently read 60 – 100°C higher than the model predicts. Therefore the peak temperature could be considerably under predicted.

Capsule 3 peak and avg fuel temperatures (calculated)



Capsules 2, 4, 5 peak and avg fuel temperatures (calculated)

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Details of last half of Cycle 166A operations

Technical Coordination Team

November 11, 2019

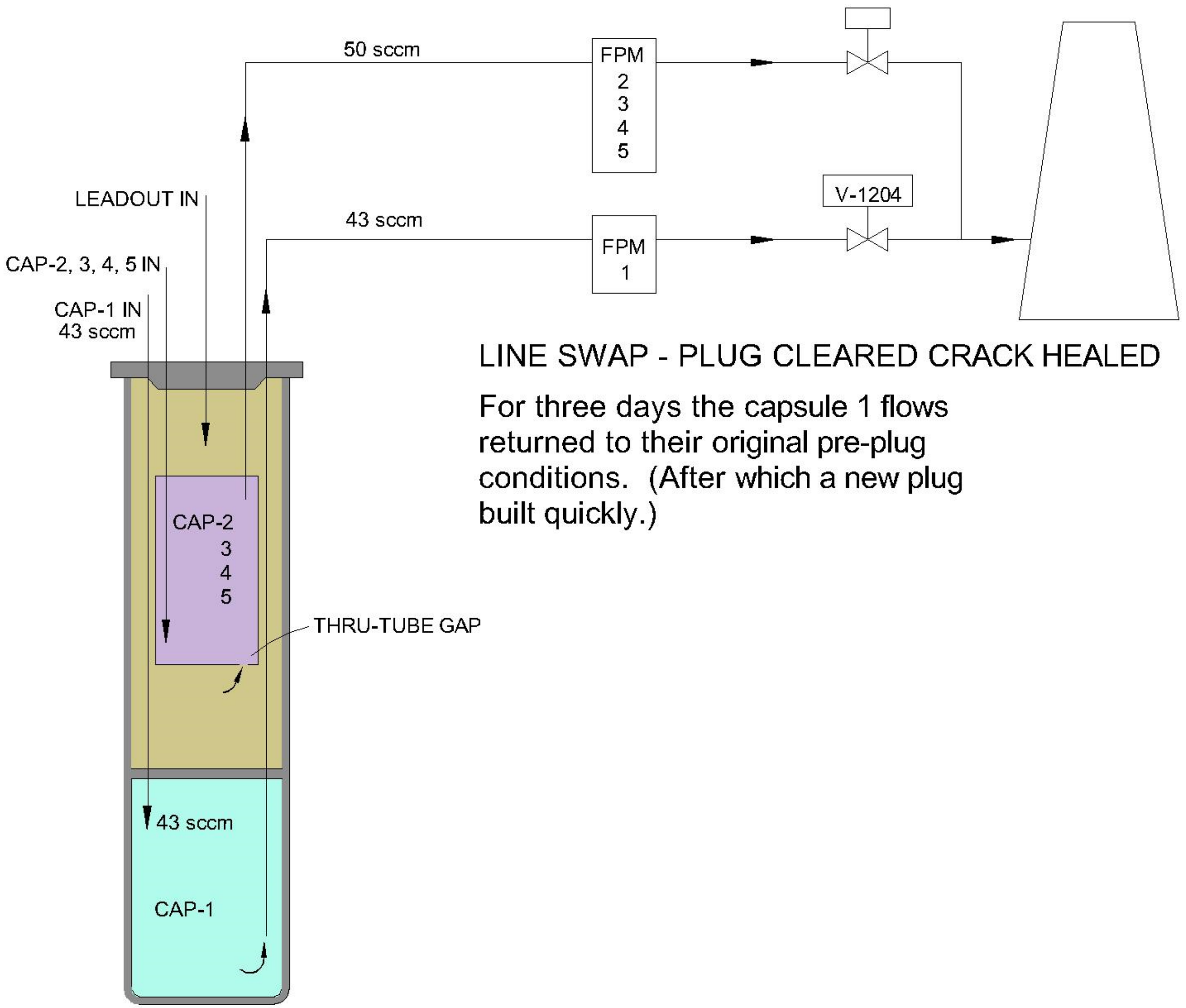
Joe Palmer

Mechanical Engineer, PE

ART

ADVANCED REACTOR TECHNOLOGIES

Capsule 1 line swap – plug cleared, crack closed

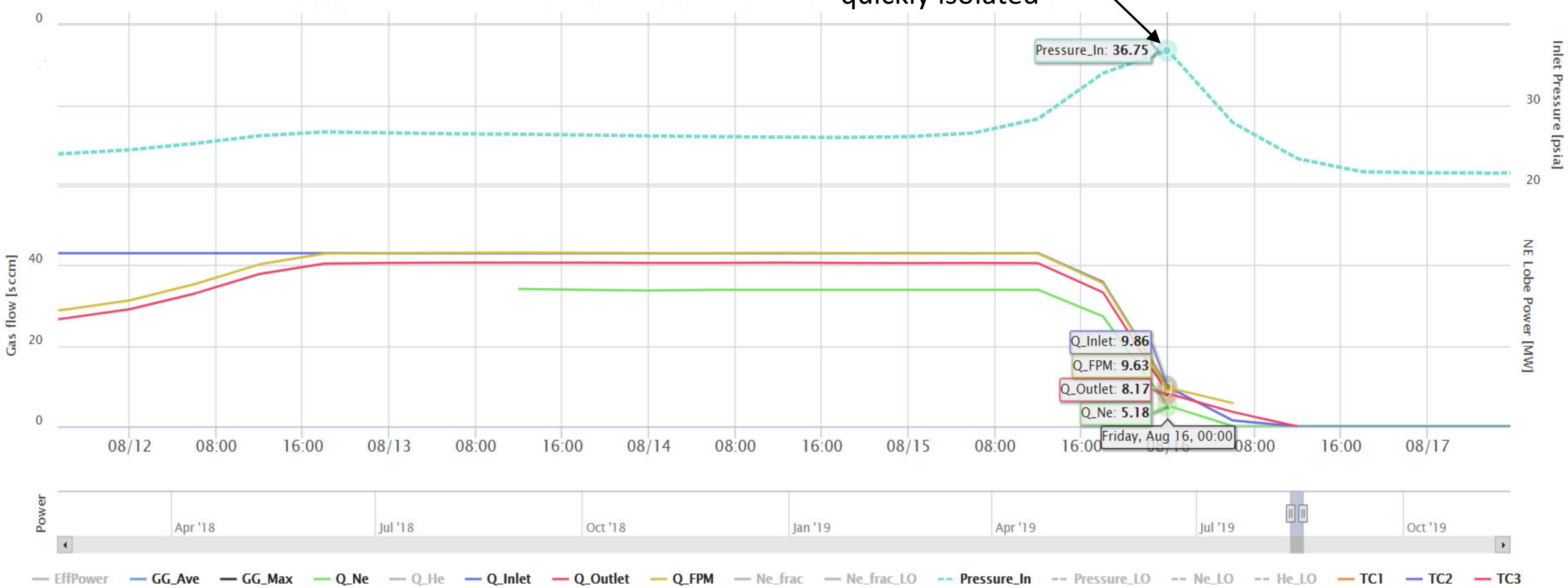


LINE SWAP - PLUG CLEARED CRACK HEALED

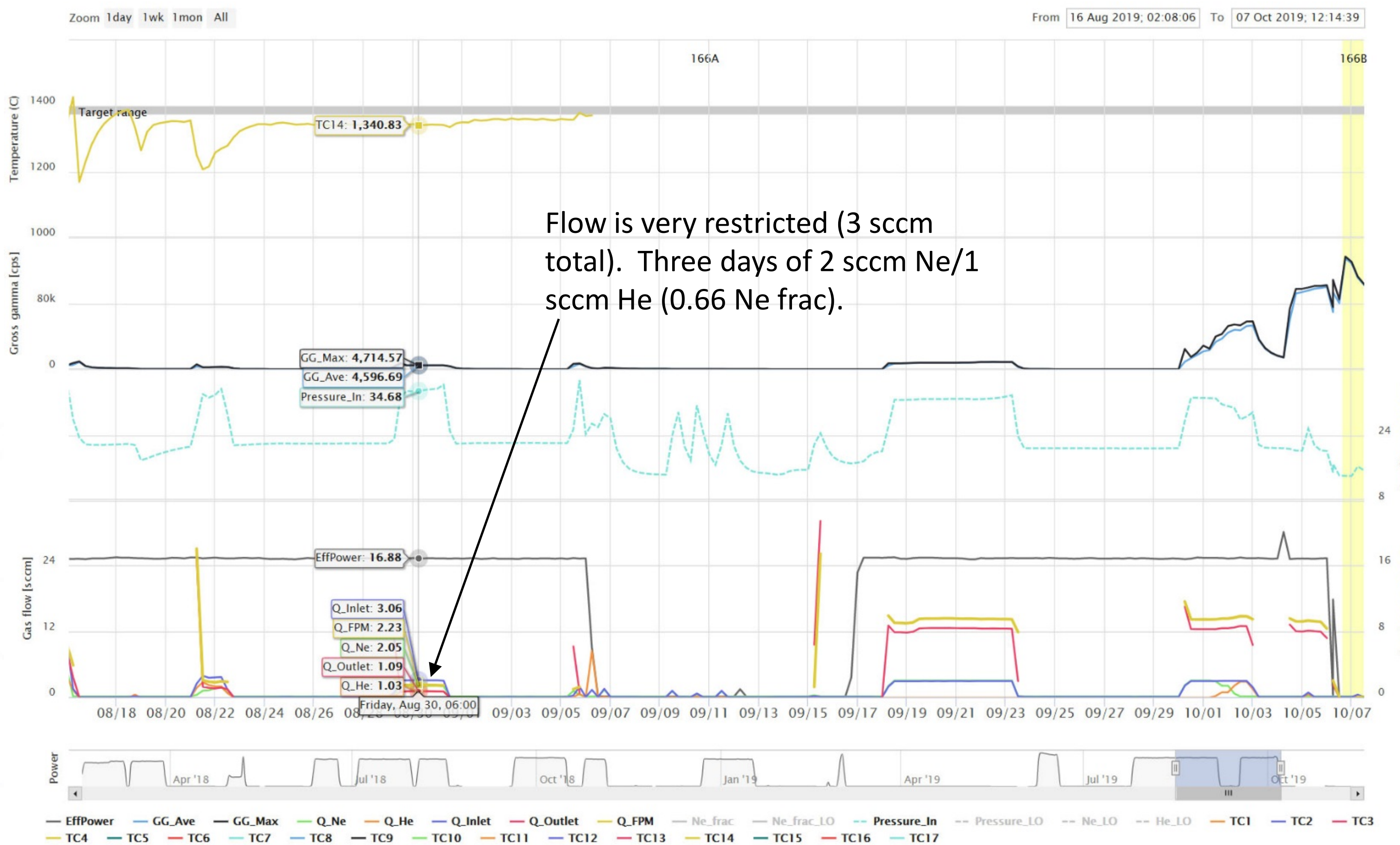
For three days the capsule 1 flows returned to their original pre-plug conditions. (After which a new plug built quickly.)

New plug appears Aug 16 - 17, 2019

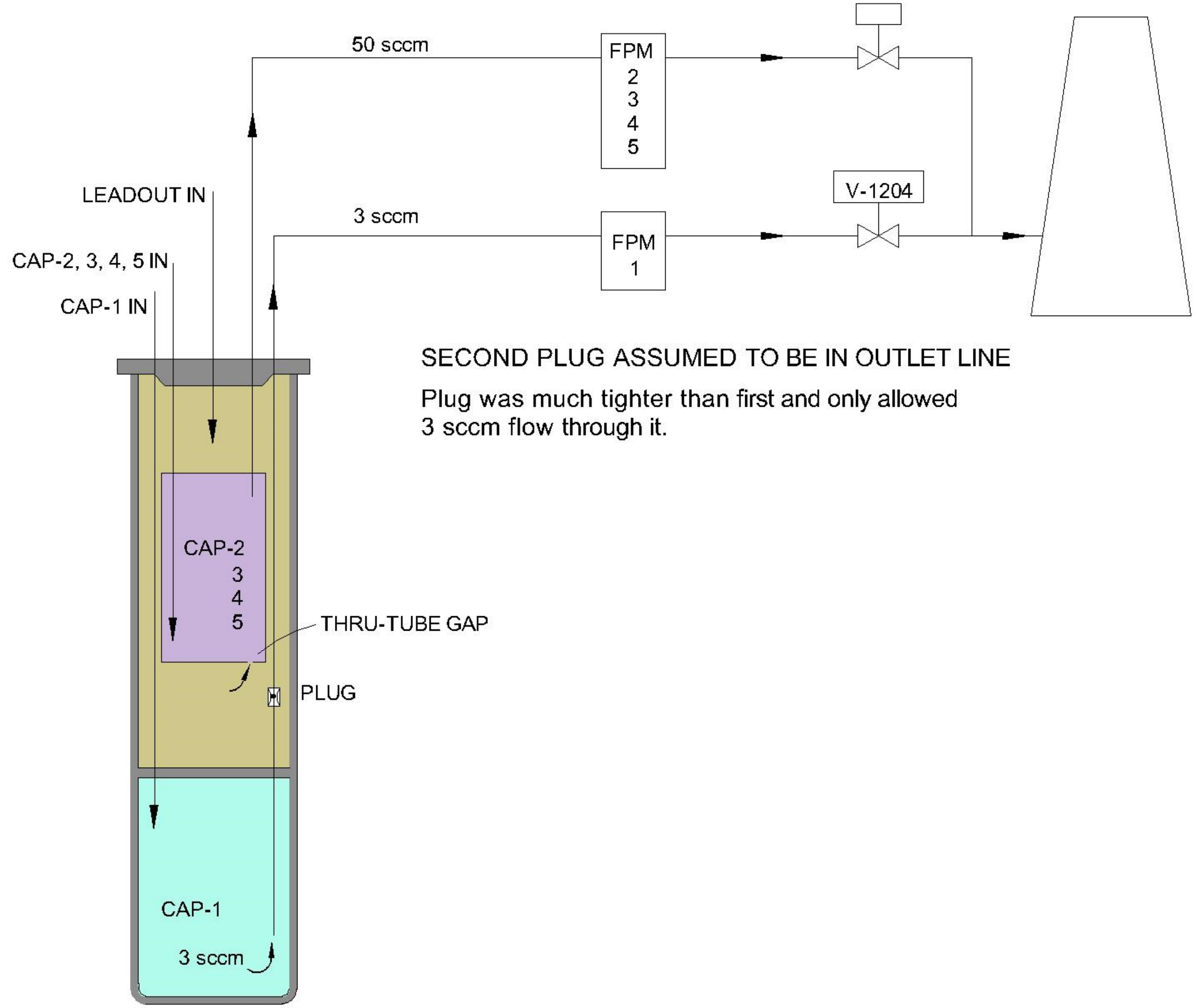
Pressure rose much more quickly than first plug and capsule 1 was quickly isolated



Cycle 166A August 18 to End of Cycle



Second plug allows little flow

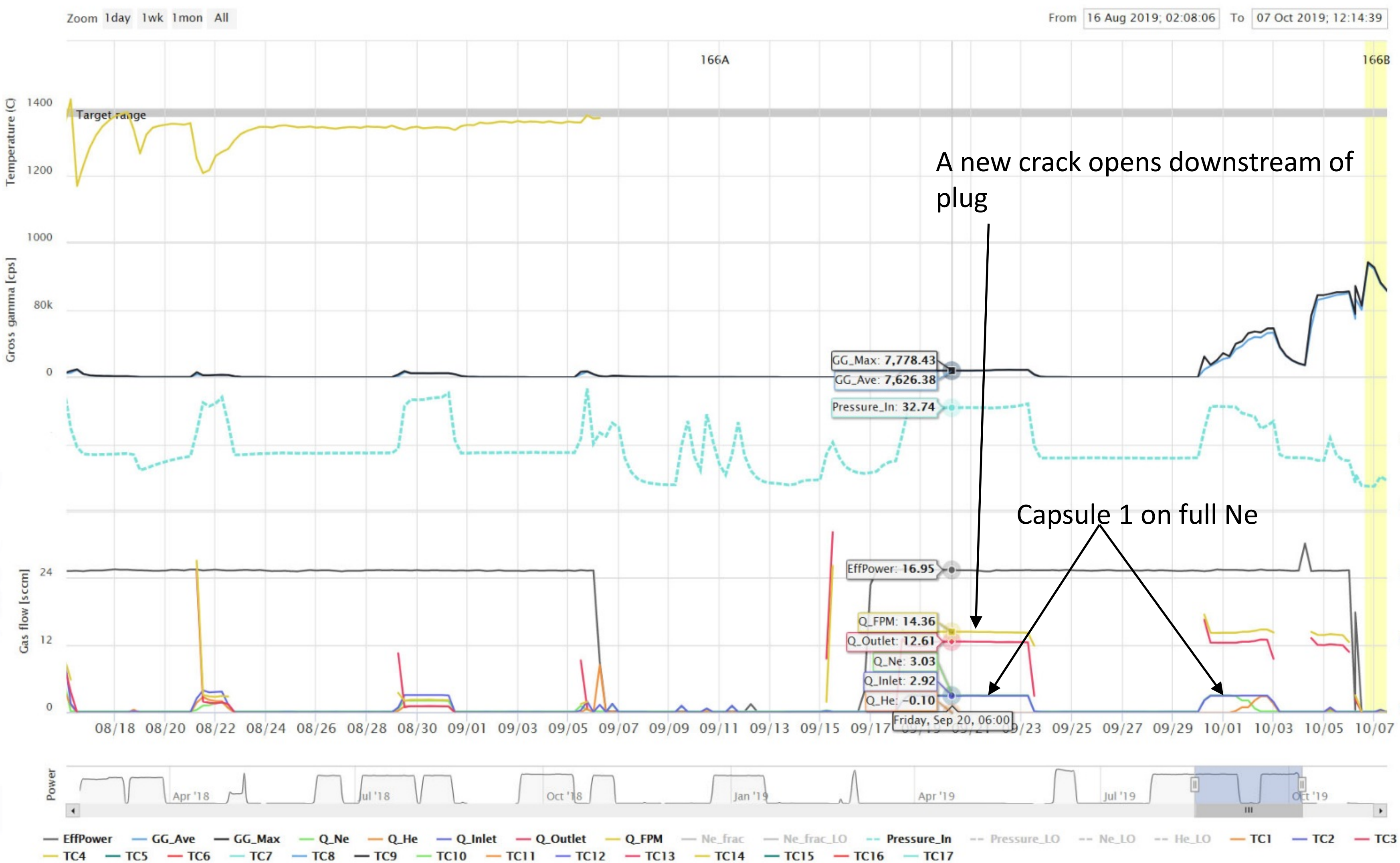


SECOND PLUG ASSUMED TO BE IN OUTLET LINE

Plug was much tighter than first and only allowed 3 sccm flow through it.

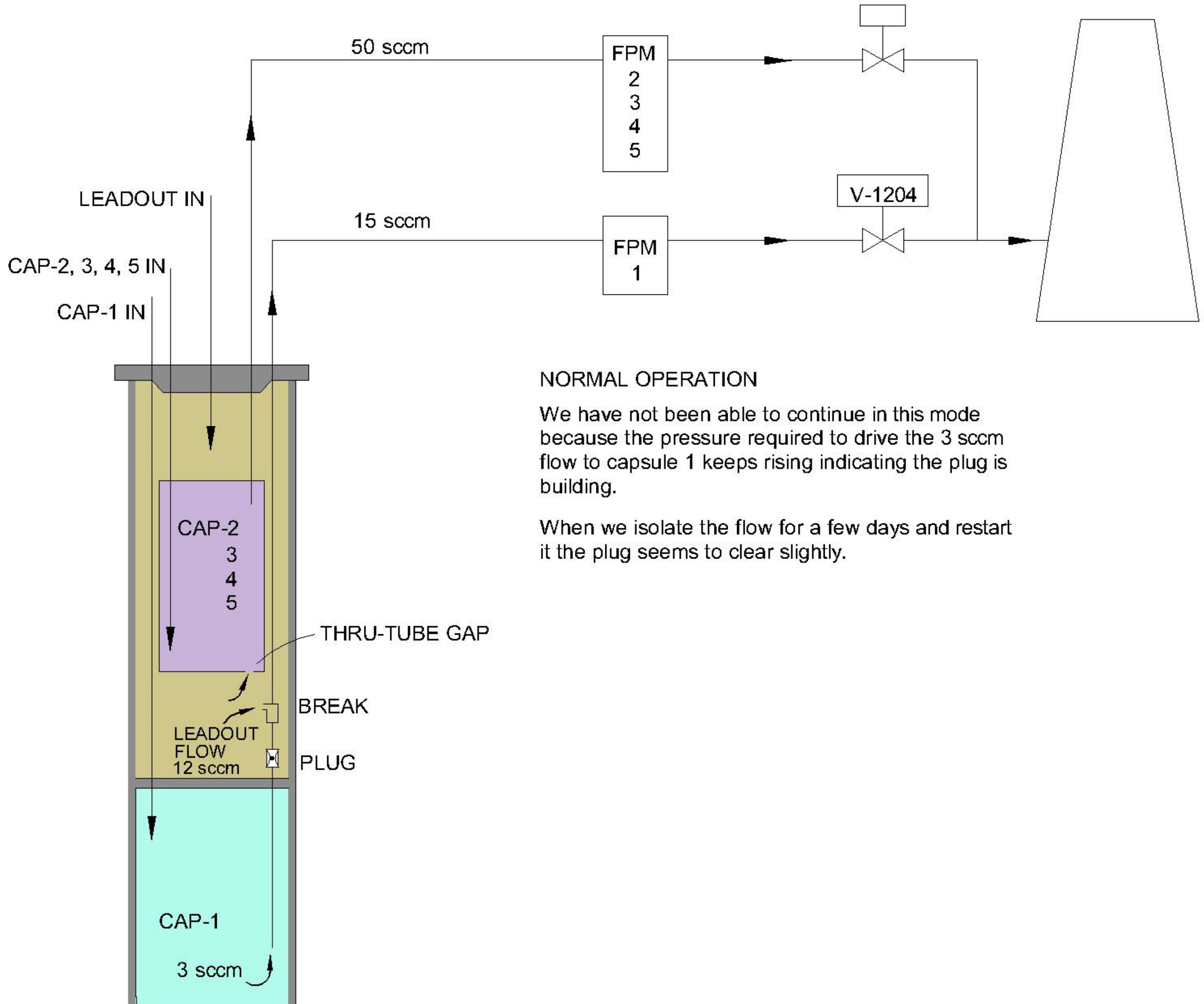
ADVANCED REACTOR TECHNOLOGIES

Cycle 166A August 18 to End of Cycle



ADVANCED REACTOR TECHNOLOGIES

166A operating mode after new crack identified

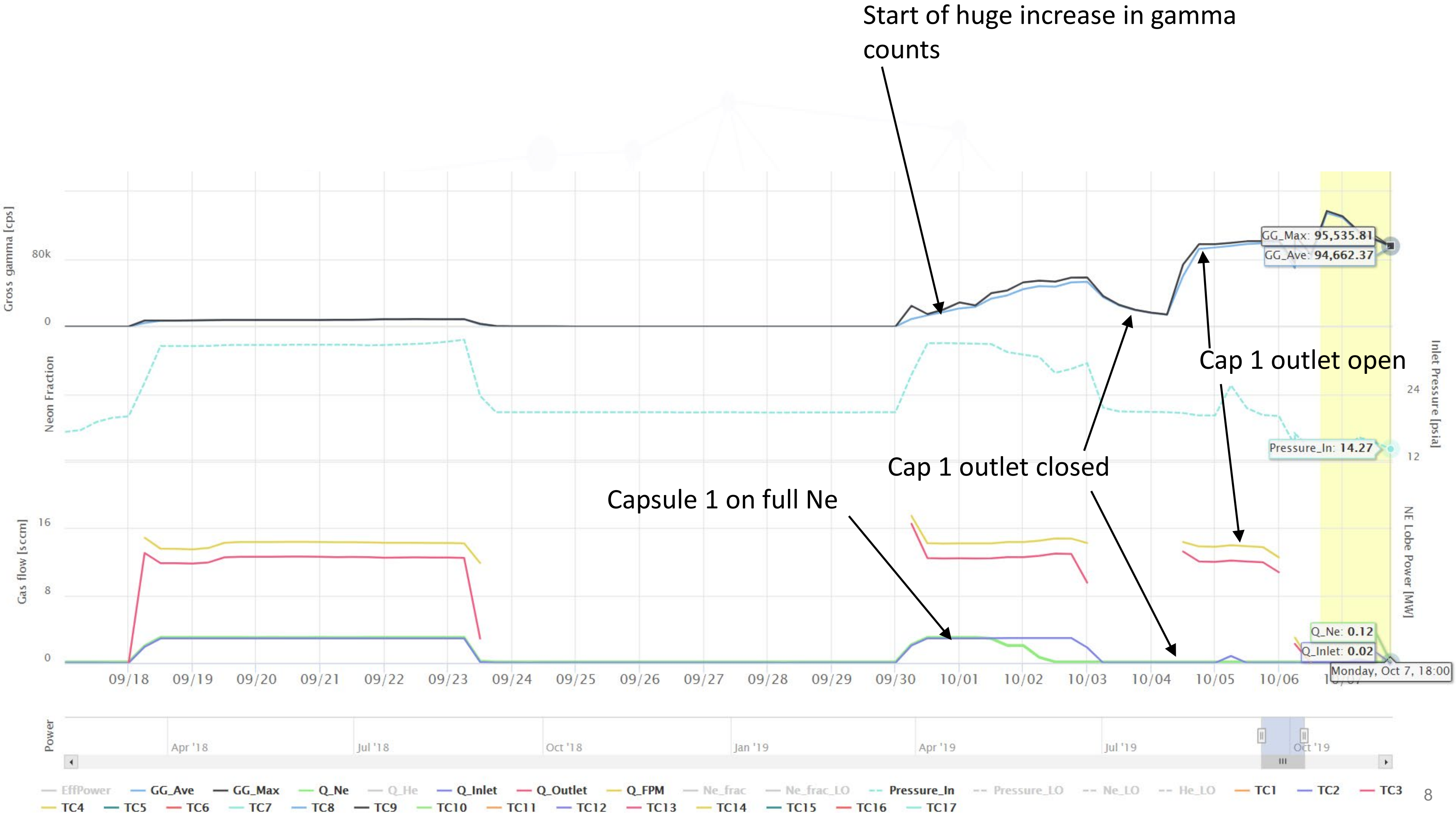


NORMAL OPERATION

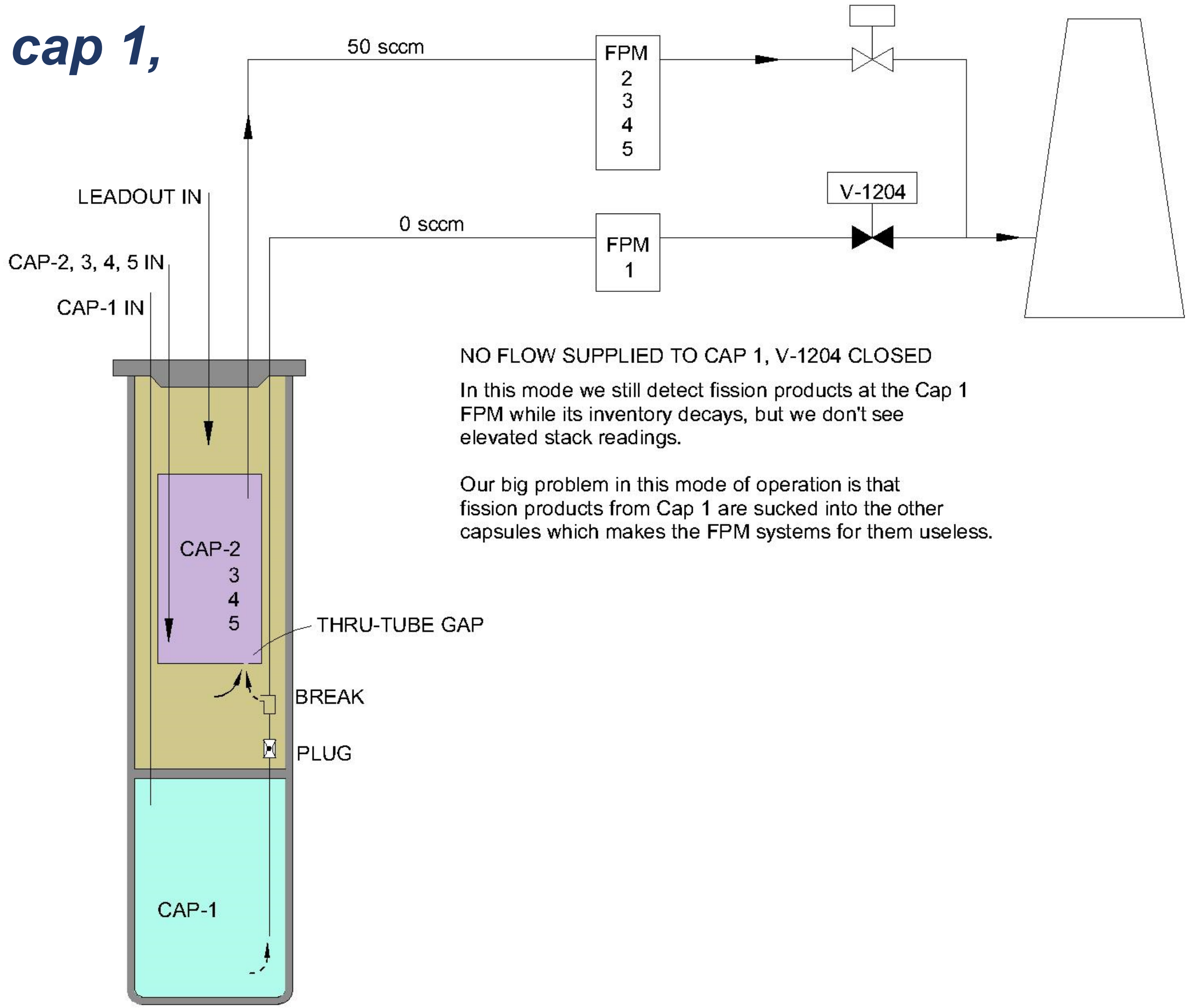
We have not been able to continue in this mode because the pressure required to drive the 3 sccm flow to capsule 1 keeps rising indicating the plug is building.

When we isolate the flow for a few days and restart it the plug seems to clear slightly.

Last few days of cycle 166A



No flow supplied to cap 1, outlet blocked

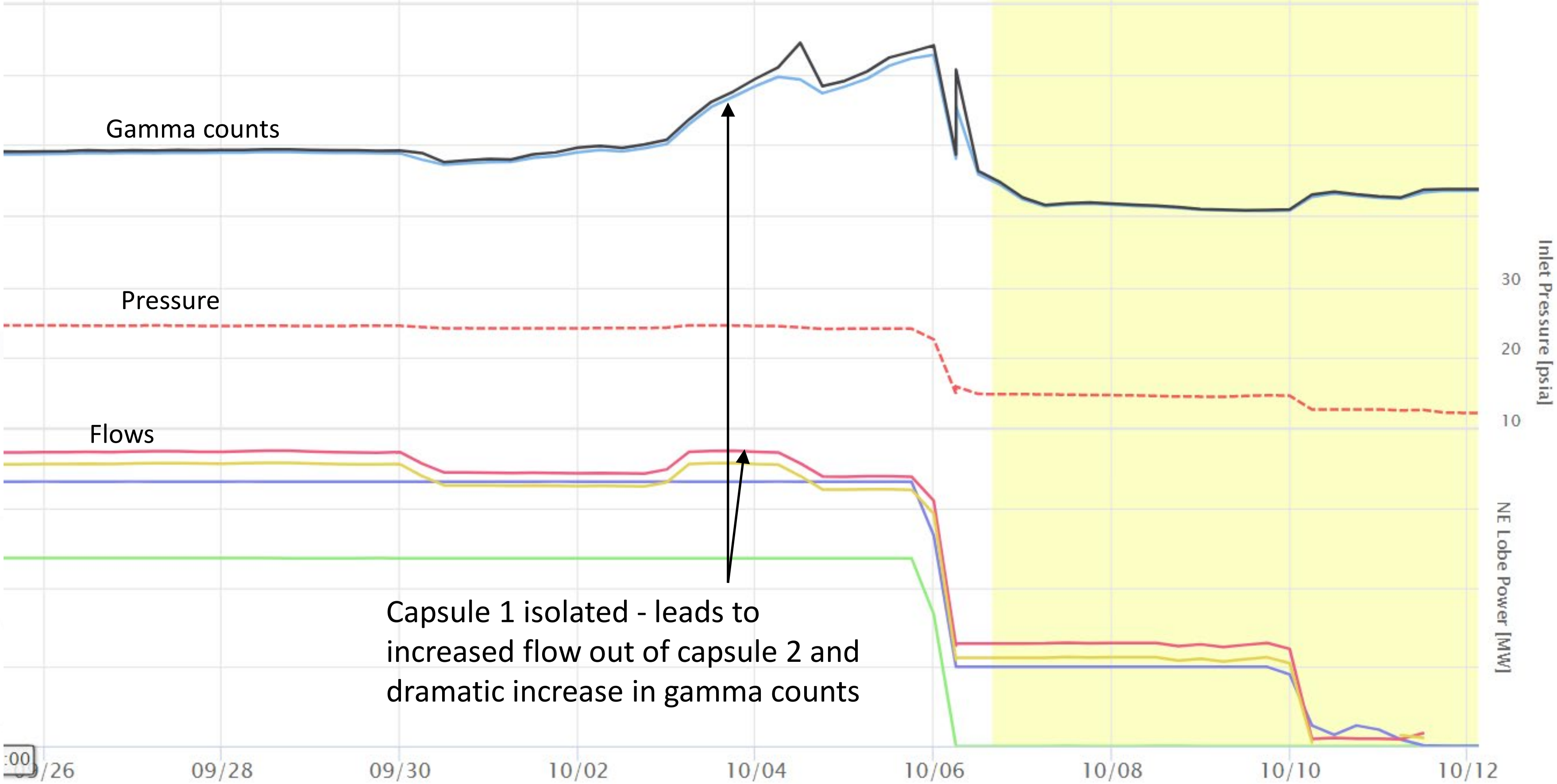


NO FLOW SUPPLIED TO CAP 1, V-1204 CLOSED

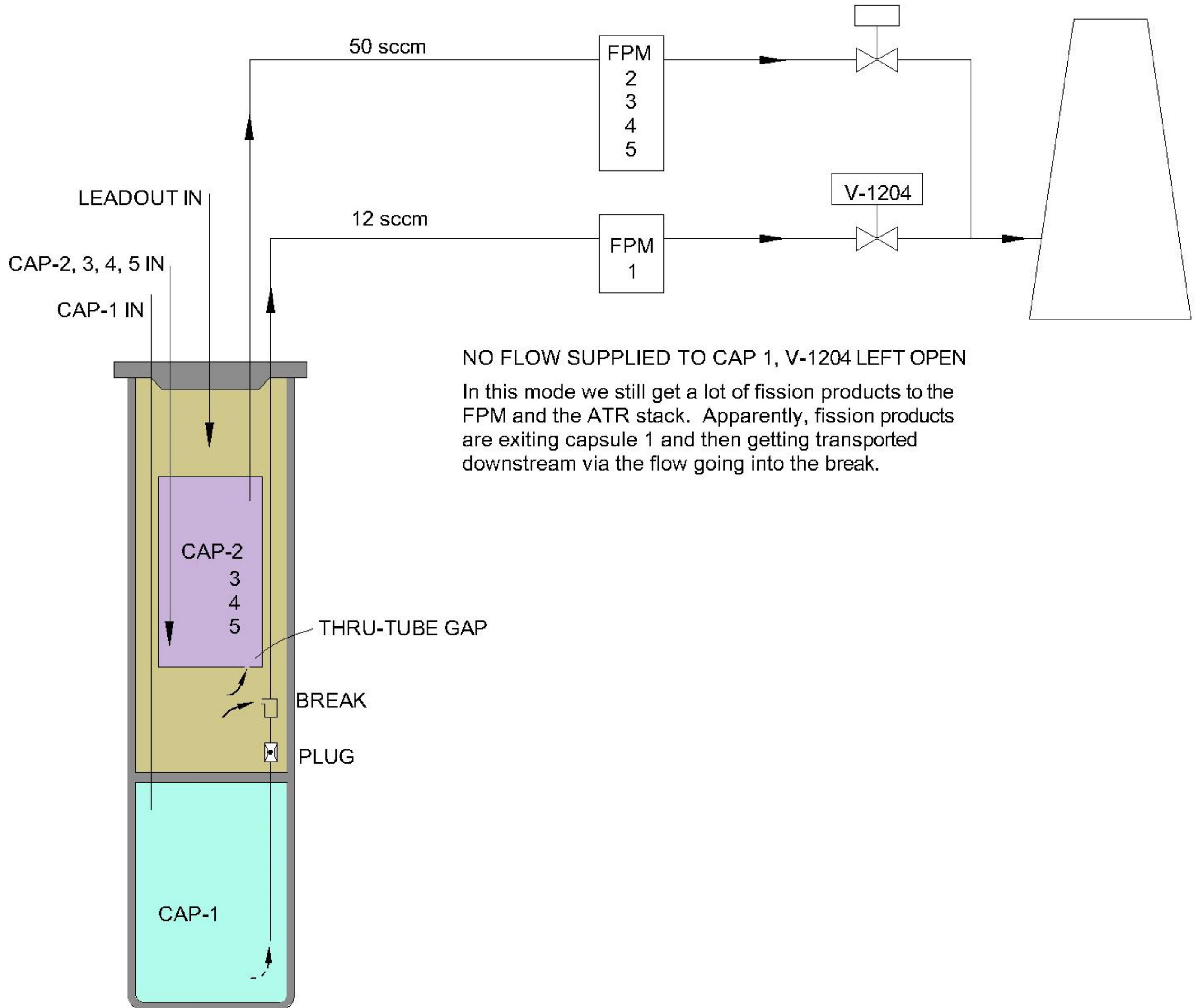
In this mode we still detect fission products at the Cap 1 FPM while its inventory decays, but we don't see elevated stack readings.

Our big problem in this mode of operation is that fission products from Cap 1 are sucked into the other capsules which makes the FPM systems for them useless.

When capsule 1 outlet was isolated this allowed fission products to enter the leadout which were then sucked up by the other capsules – capsule 2 shown below



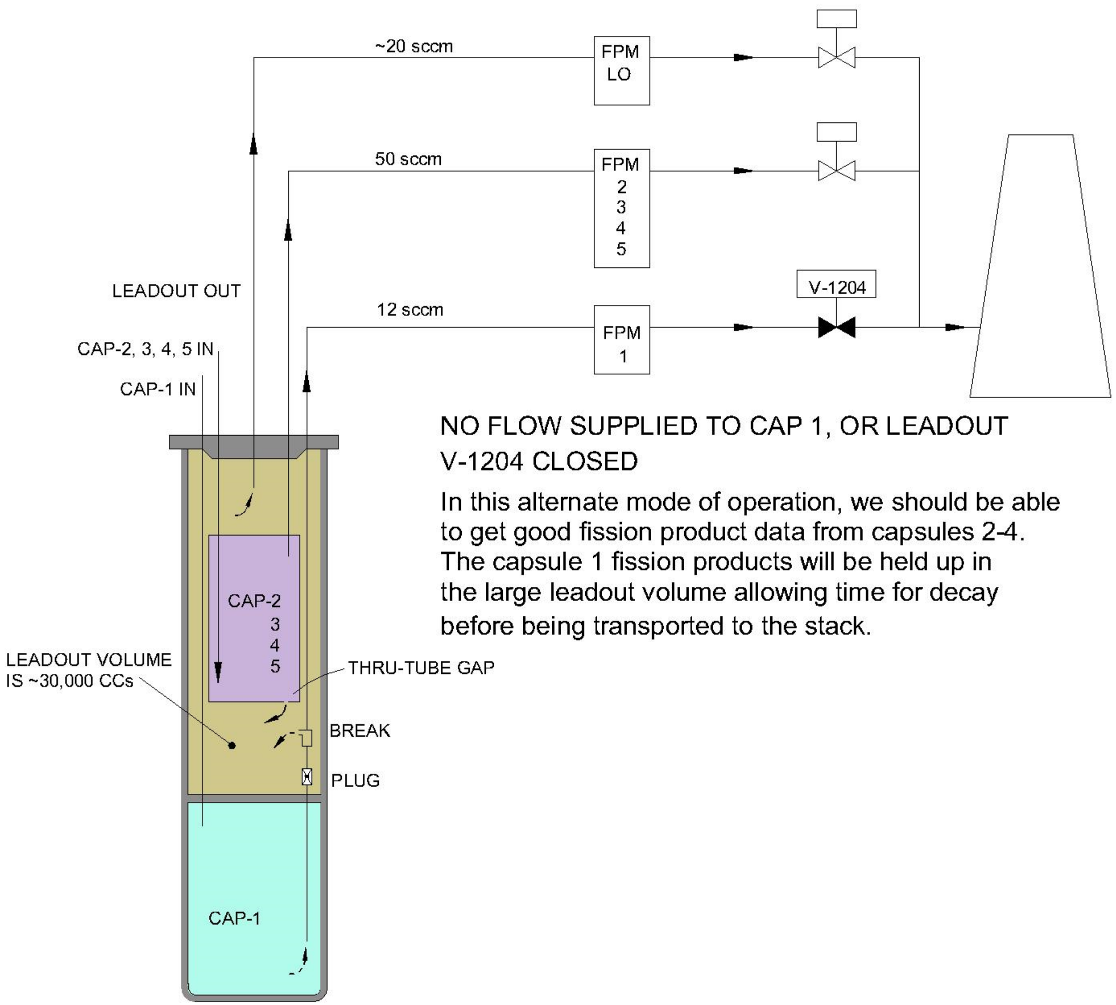
No flow supplied to cap 1 but outlet left open



NO FLOW SUPPLIED TO CAP 1, V-1204 LEFT OPEN

In this mode we still get a lot of fission products to the FPM and the ATR stack. Apparently, fission products are exiting capsule 1 and then getting transported downstream via the flow going into the break.

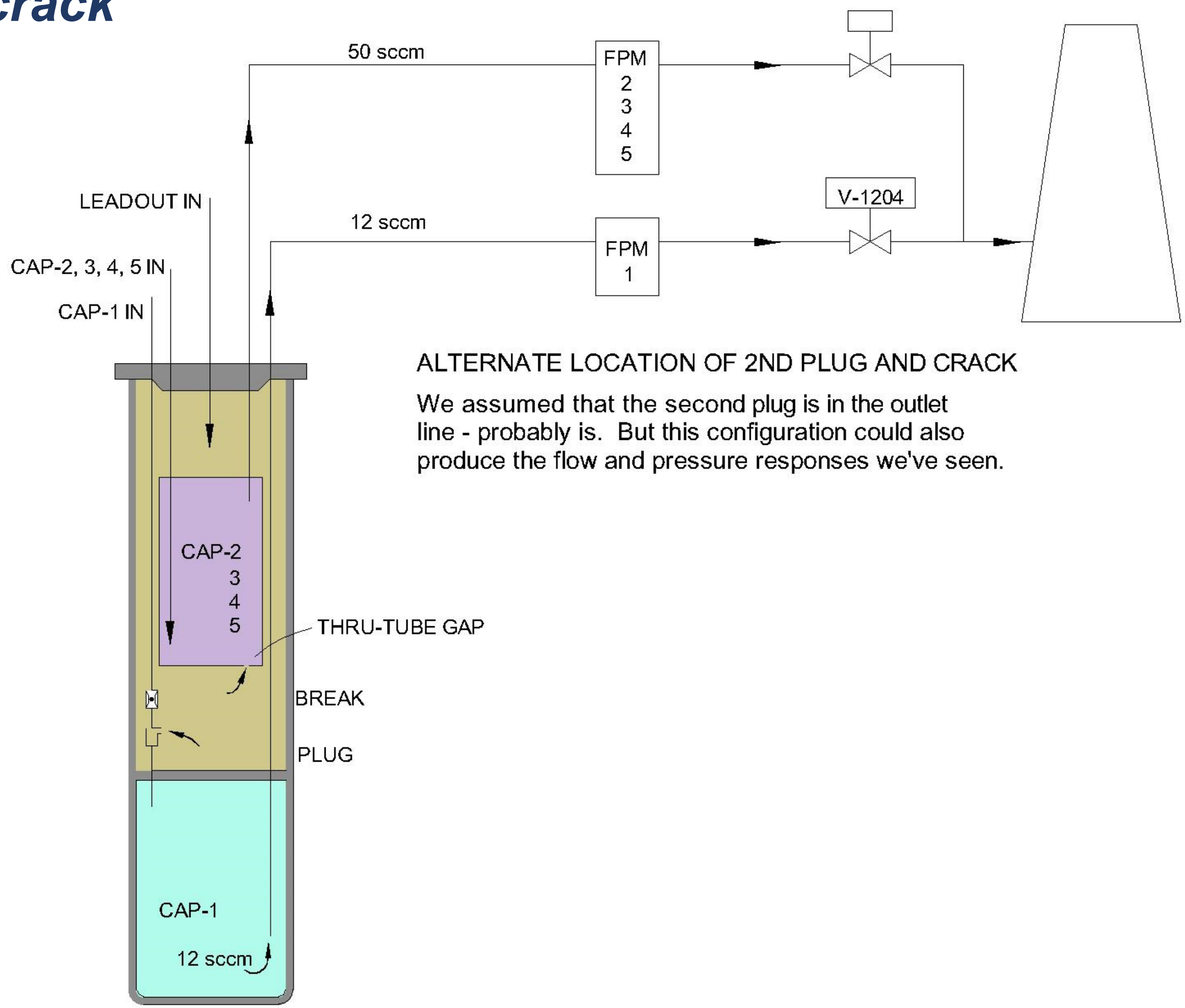
Alternate mode of operation we hope to be able to use during current cycle (166B)



NO FLOW SUPPLIED TO CAP 1, OR LEADOUT
V-1204 CLOSED

In this alternate mode of operation, we should be able to get good fission product data from capsules 2-4. The capsule 1 fission products will be held up in the large leadout volume allowing time for decay before being transported to the stack.

Alternate location of 2nd plug and crack



ALTERNATE LOCATION OF 2ND PLUG AND CRACK

We assumed that the second plug is in the outlet line - probably is. But this configuration could also produce the flow and pressure responses we've seen.

Information and musing relative to capsule 1 particle failures

- Thermocouple measurements indicate peak temperatures in Capsule 1 could have been as much 100^{o}C higher than predicted by the model. That would still be only ~1480^{o}C. Even another 100^{o}C higher than that shouldn’t theoretically be a problem, especially over just a few days.
- When the failures first occurred I wondered if perhaps the spring quit pressing the holder against the top head, and temperatures went very high.

Capsule 1 cross-sections

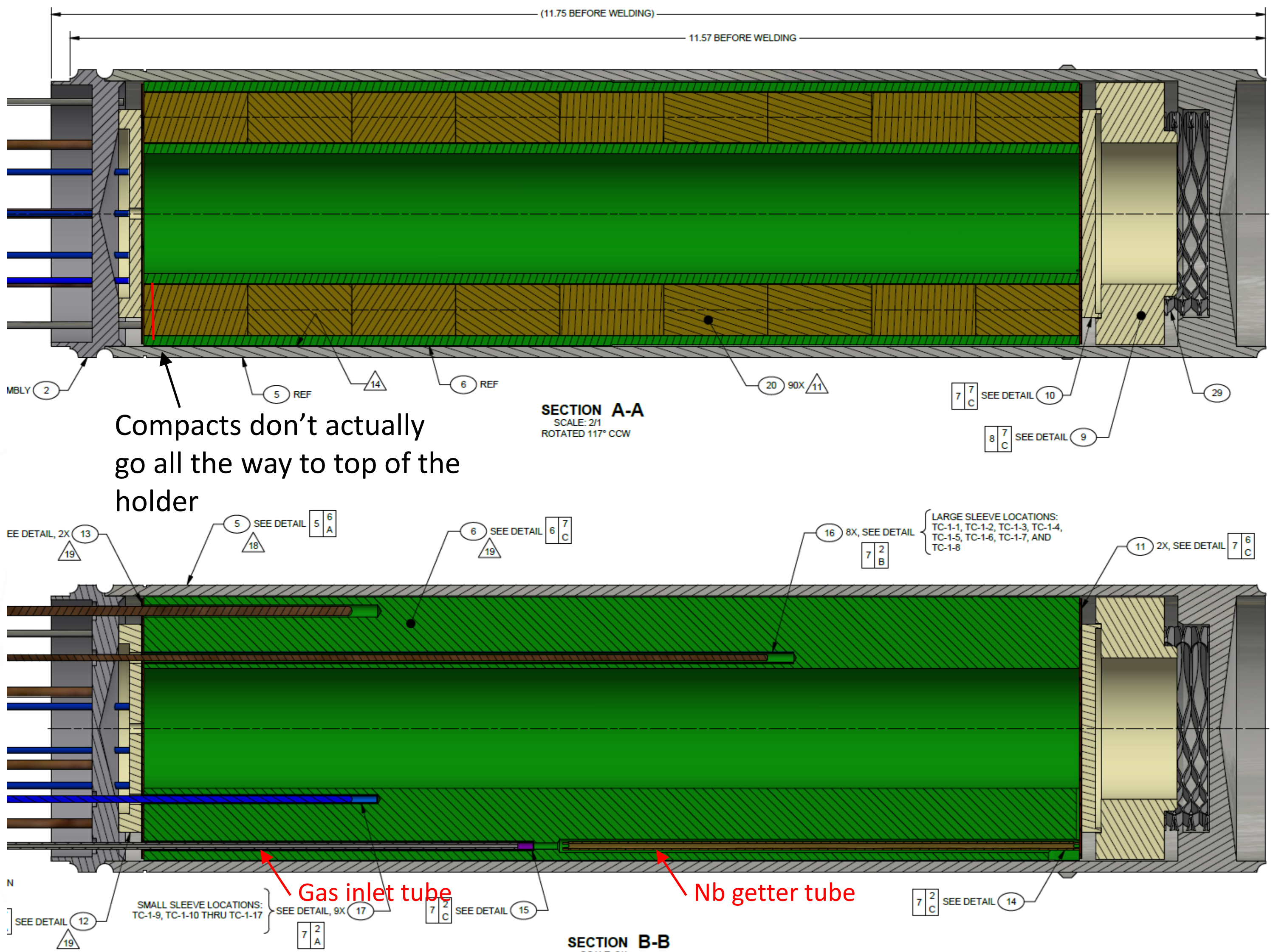
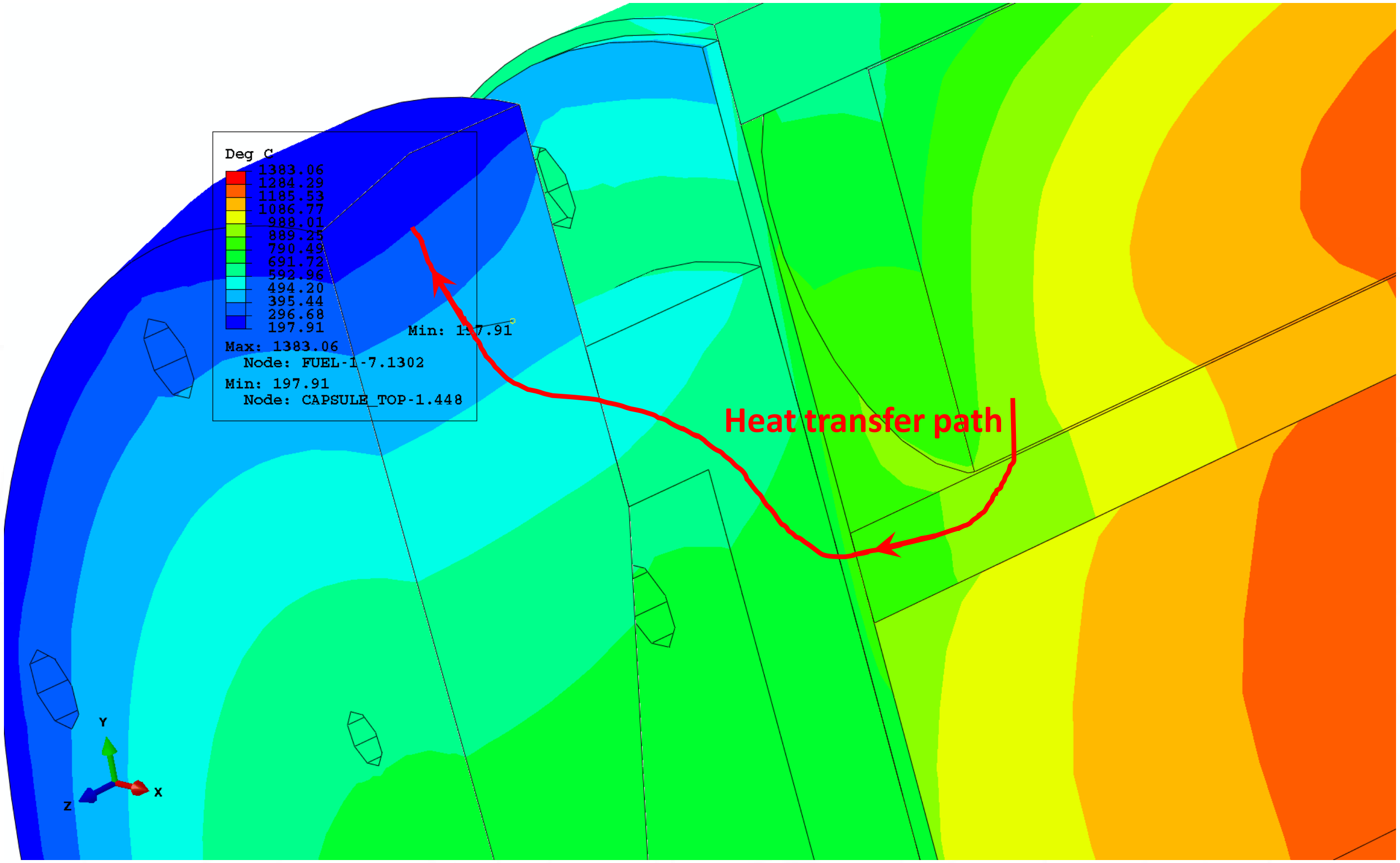


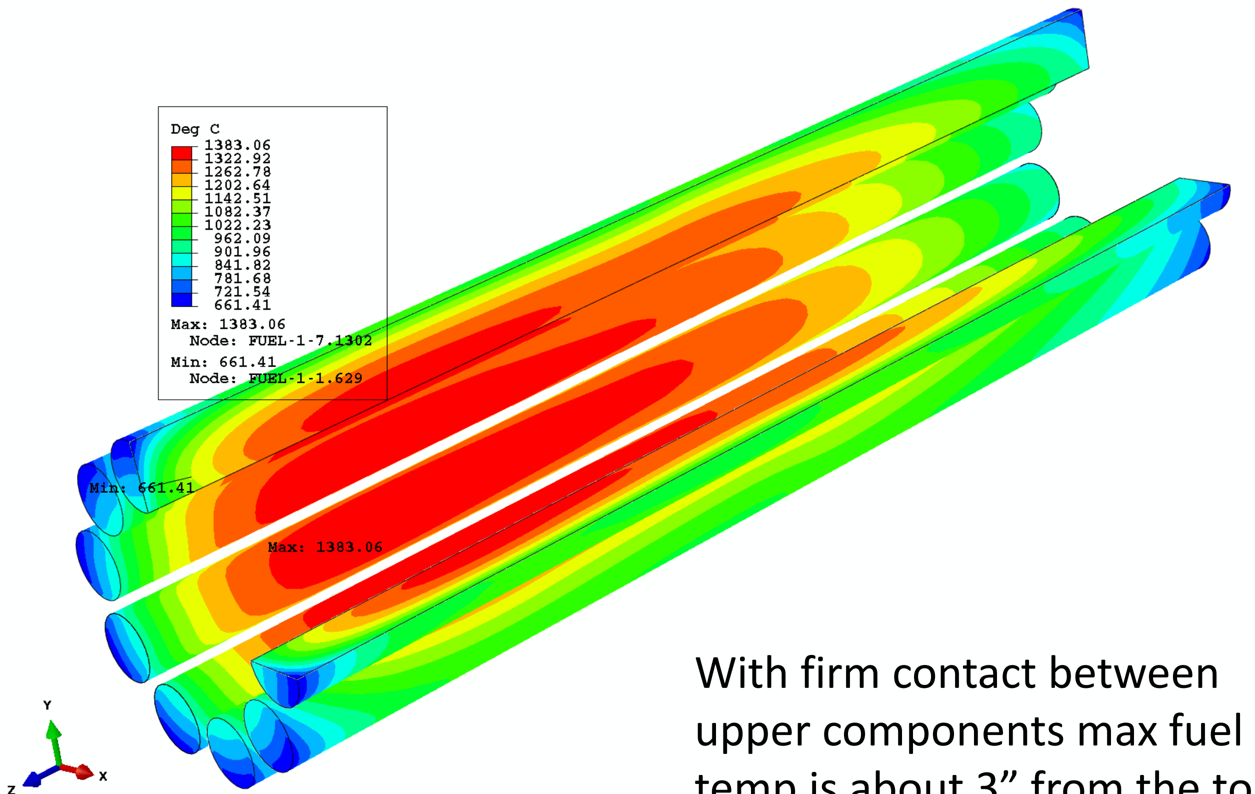
Photo showing compact stacks do not go to top of holder

We specified slight shorter compacts so that they would always fit inside the holder regardless of shrinkage

It turns out the heat transfer scheme adopted for capsule 1 doesn't work as intended – doesn't matter whether there is contact between the holder and lid



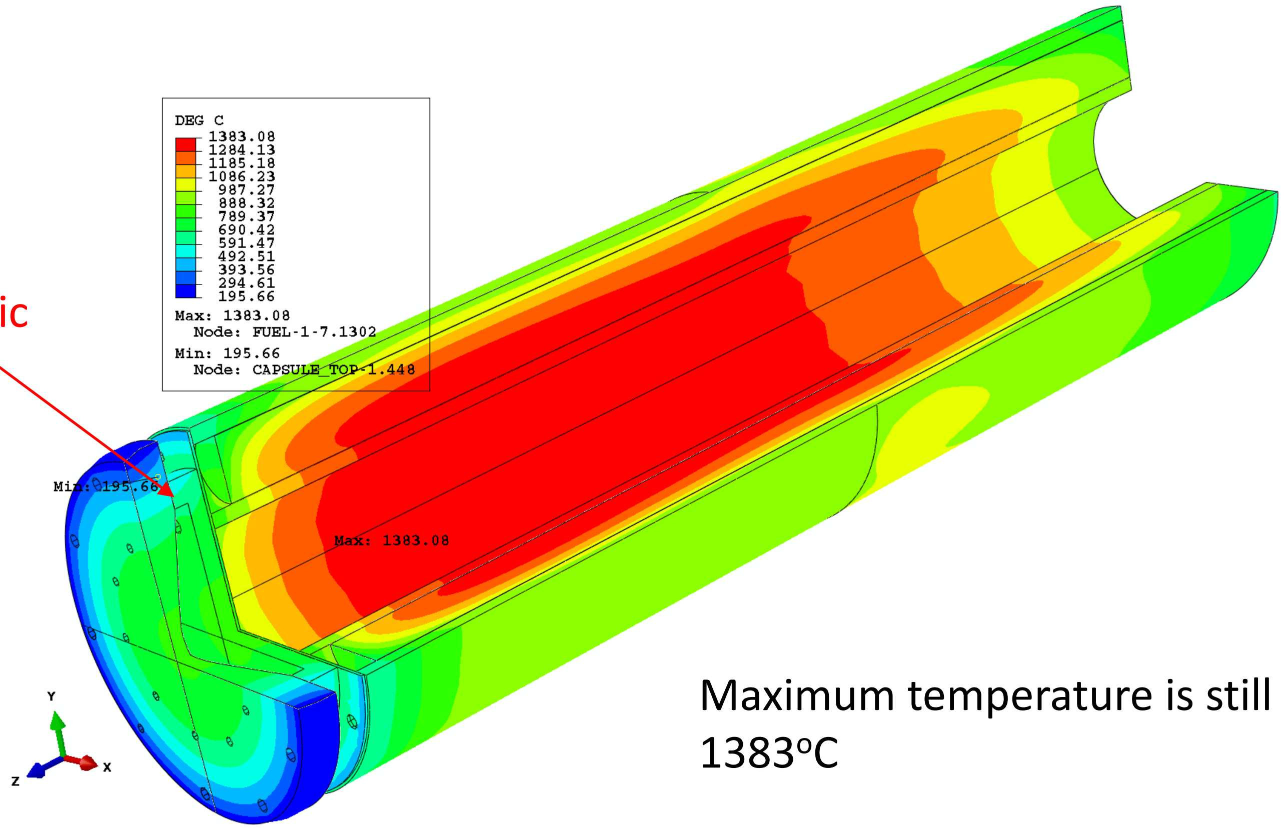
Temperature contours with good contact at top



With firm contact between upper components max fuel temp is about 3" from the top and is 1383°C

Temperature contours with poor contact at top

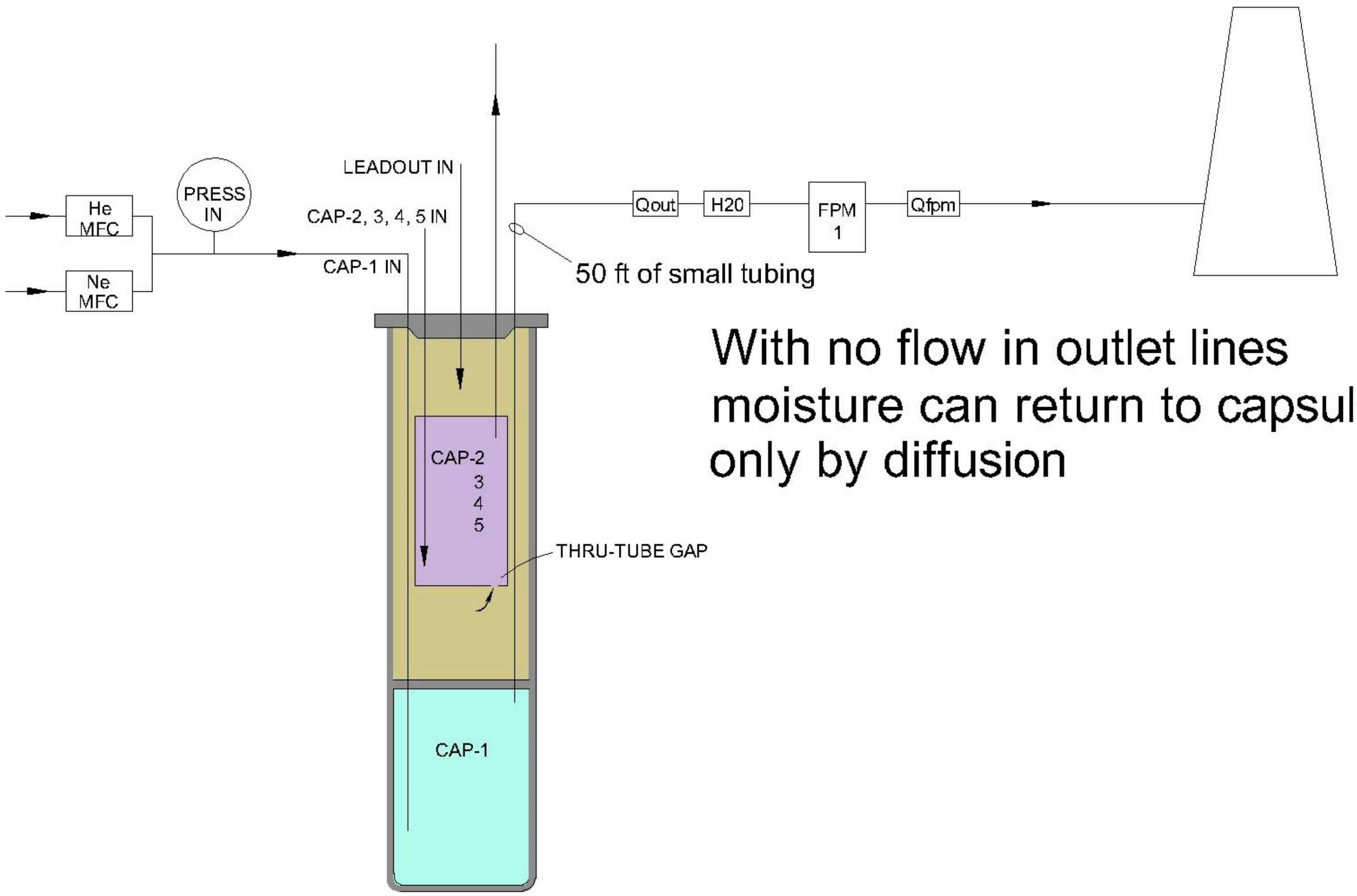
Set to adiabatic



Maximum temperature is still 1383^{o}C

How about moisture ingress?

- We only measure moisture in the outlet lines



With no flow in outlet lines moisture can return to capsules only by diffusion

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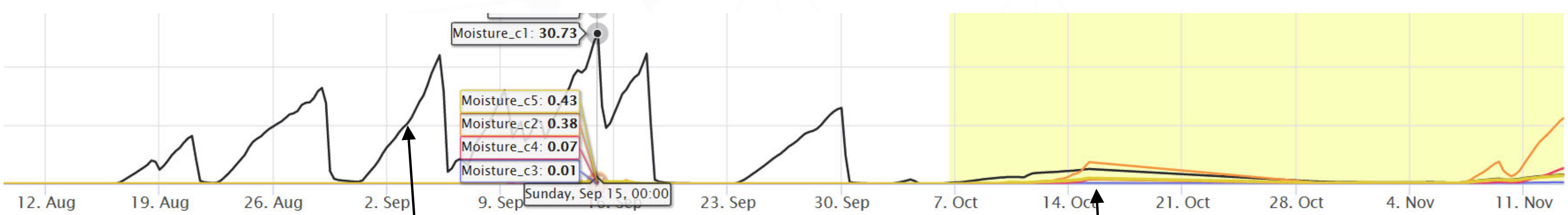
ADVANCED REACTOR TECHNOLOGIES

When capsules are isolated moisture levels in downstream lines increase



Cap 1 start and stop of flow at end of 166A

Outage with no flow through capsules

Is there perhaps a common mode failure behind the capsule 1 plugged and cracked lines, and the fuel particle failures?

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AGR-5/6/7 Path Forward – Cycle 166B and Beyond

Technical Coordination Team

November 11, 2019

Joe Palmer

Mechanical Engineer, PE

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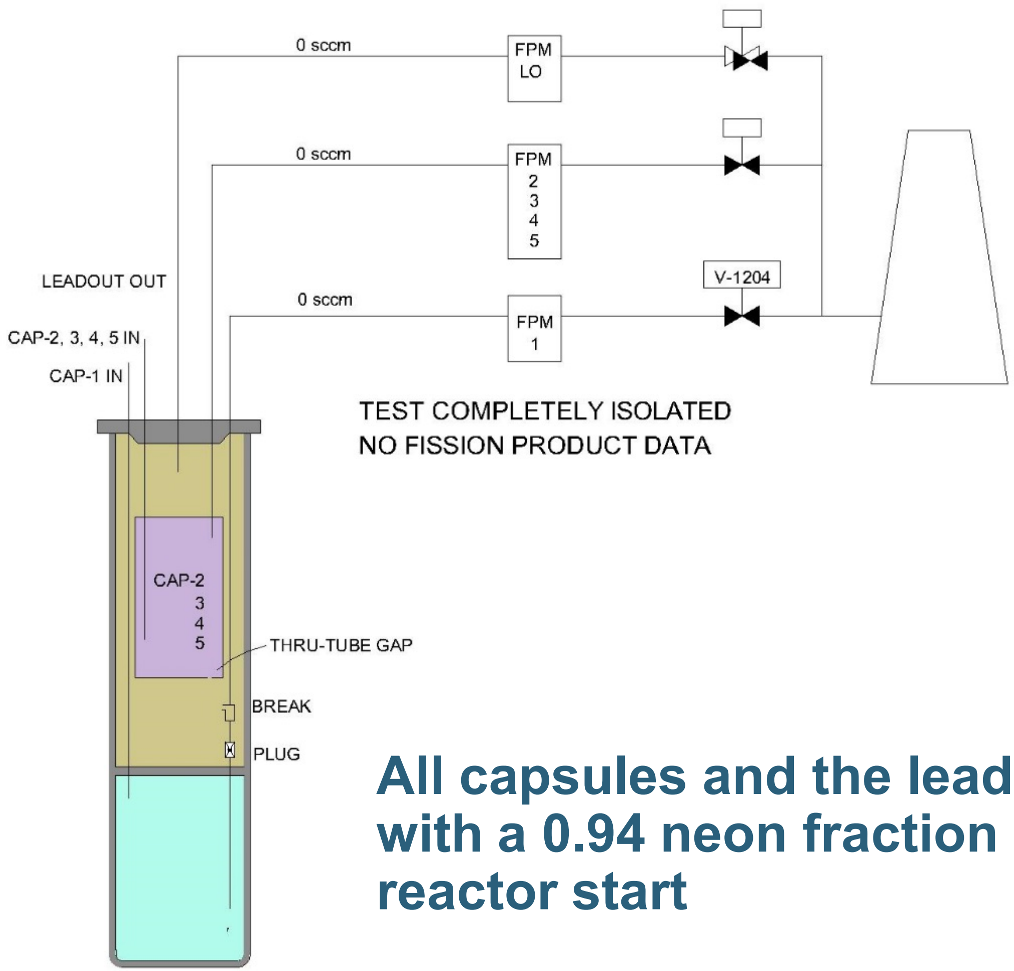
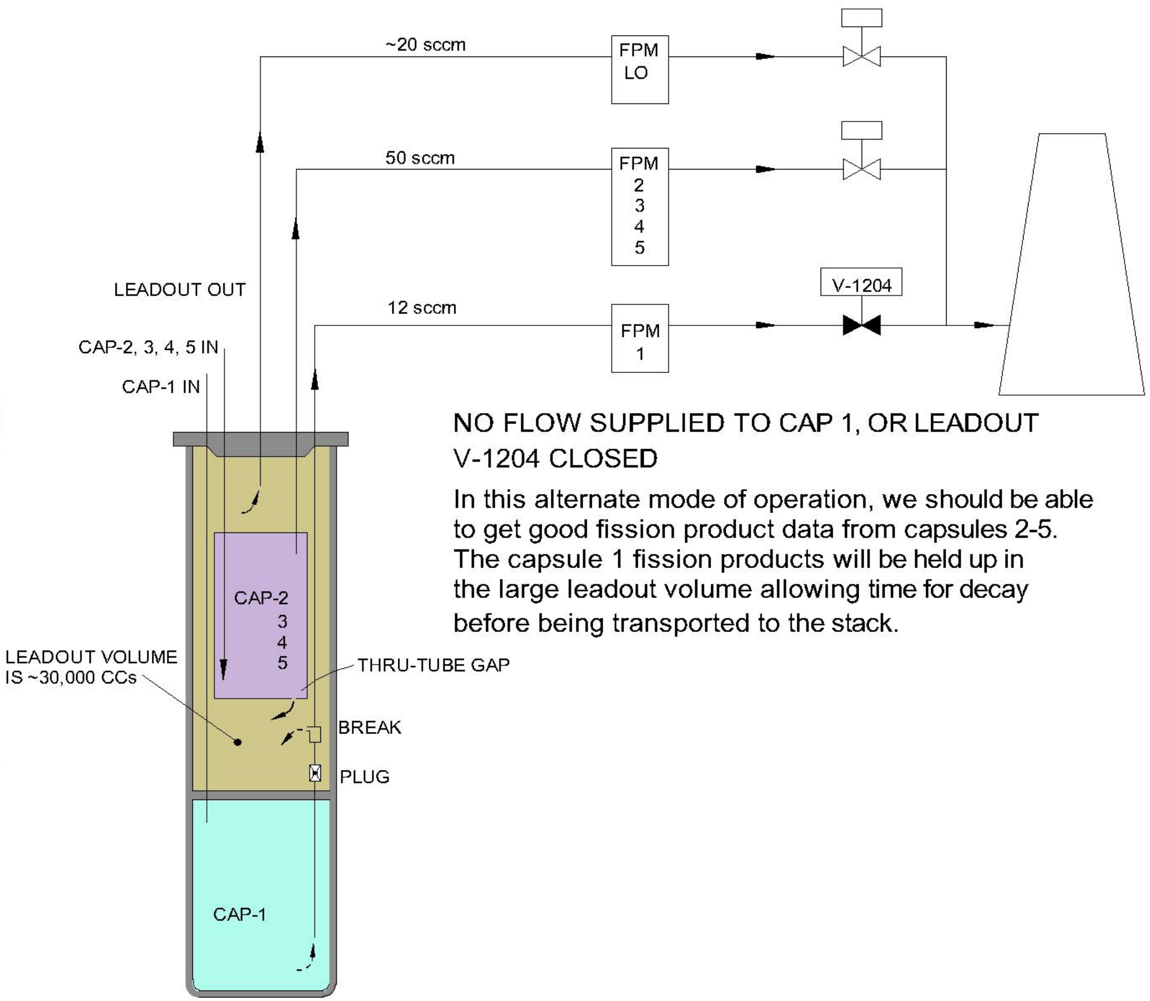
ADVANCED REACTOR TECHNOLOGIES

Current operating mode of AGR-5/6/7



All capsules and the leadout were prefilled with a 0.94 neon fraction blend prior to reactor start

Alternate mode of operation we hope to be able to use during current cycle (166B)

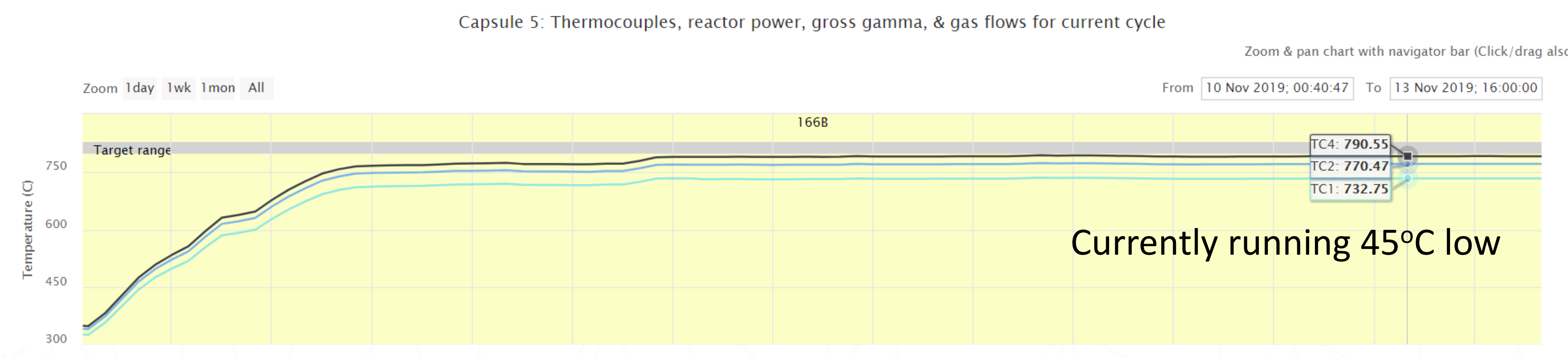


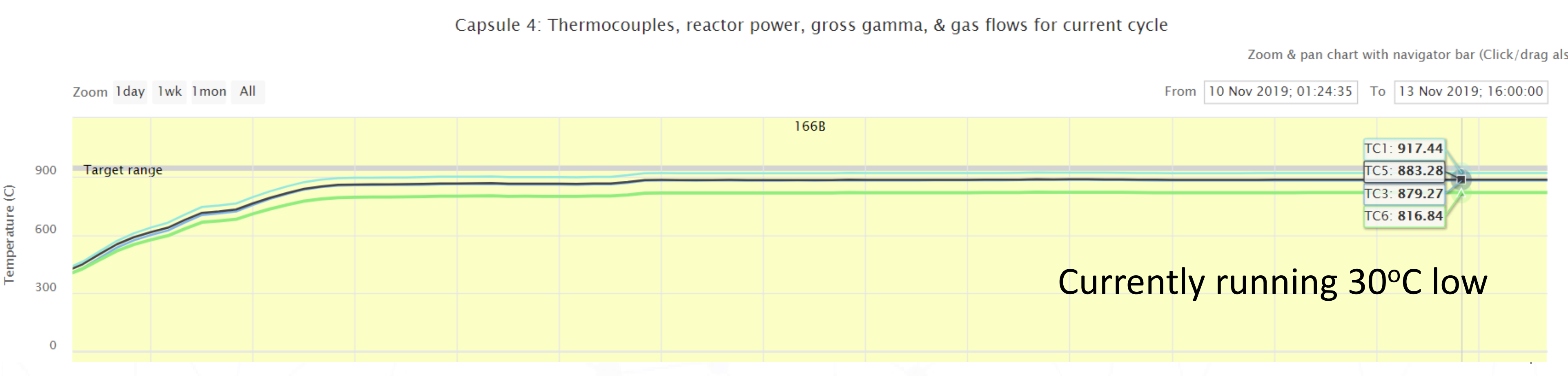
NO FLOW SUPPLIED TO CAP 1, OR LEADOUT

V-1204 CLOSED

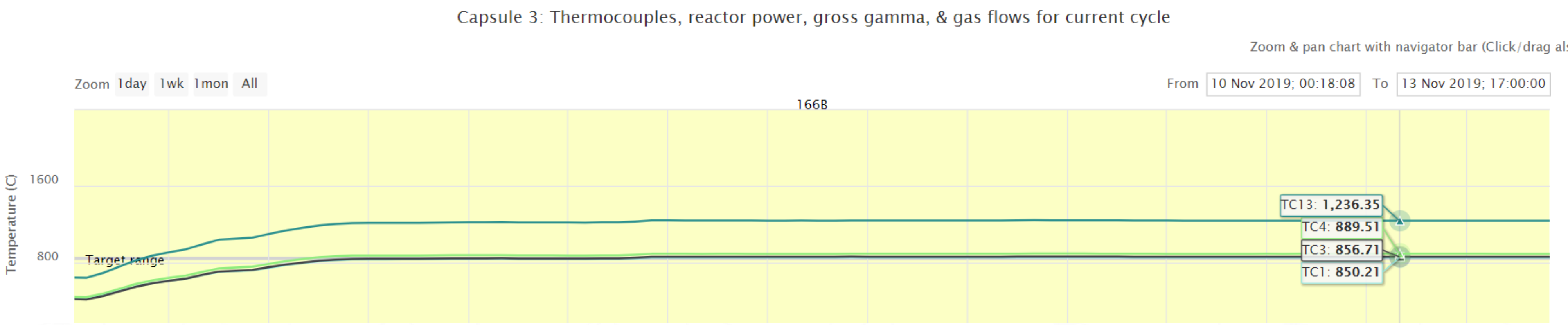
In this alternate mode of operation, we should be able to get good fission product data from capsules 2-5. The capsule 1 fission products will be held up in the large leadout volume allowing time for decay before being transported to the stack.

Capsules 4 and 5 current temperatures





Capsule 3 current temperatures



Currently running about 20°C high

Capsules 1 and 2 current temperatures

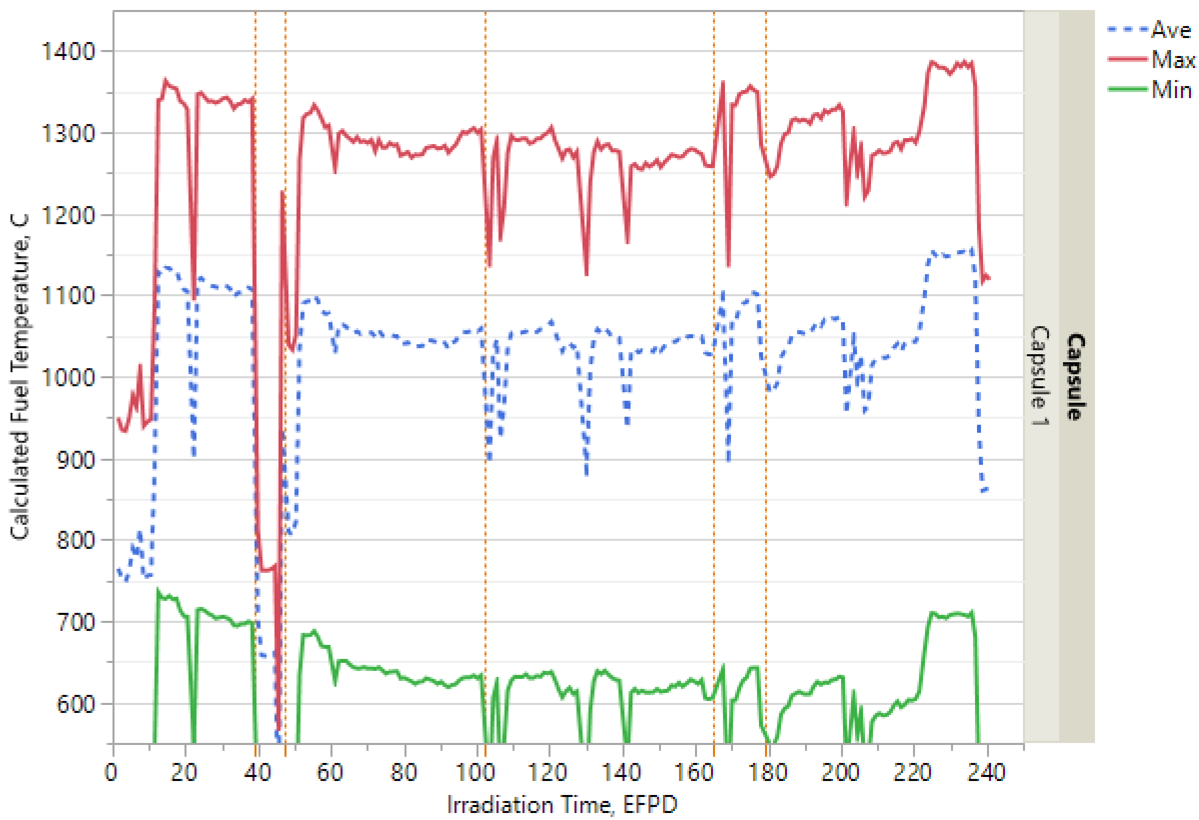
- There are no functioning thermocouples in these capsules
- Capsule 1 should be running at temperatures slightly below what it ran at the end of cycle 166A when on full neon (vs current neon fraction of 0.94).
- We have increased the neon fraction of capsule 2 from 0.70 to 0.94. Based response of capsule 4 to a similar change, the capsule 2 peak temperatures are likely 80 – 100^{o}C higher than last cycle

If capsule 1 is a write-off what will we have left?

- Capsules 2, 4, and 5 could cover the range 700^{o}C – 1050^{o}C
- Capsule 3 could cover the range 1250^{o}C – 1500^{o}C
- There are a few (very few) particles in capsule 3 in the 1100^{o}C – 1250^{o}C range (if we continue to run at current set point)
- We may want to consider lowering the temperature of capsule 3 to put more particles in the 1100^{o}C – 1250^{o}C range

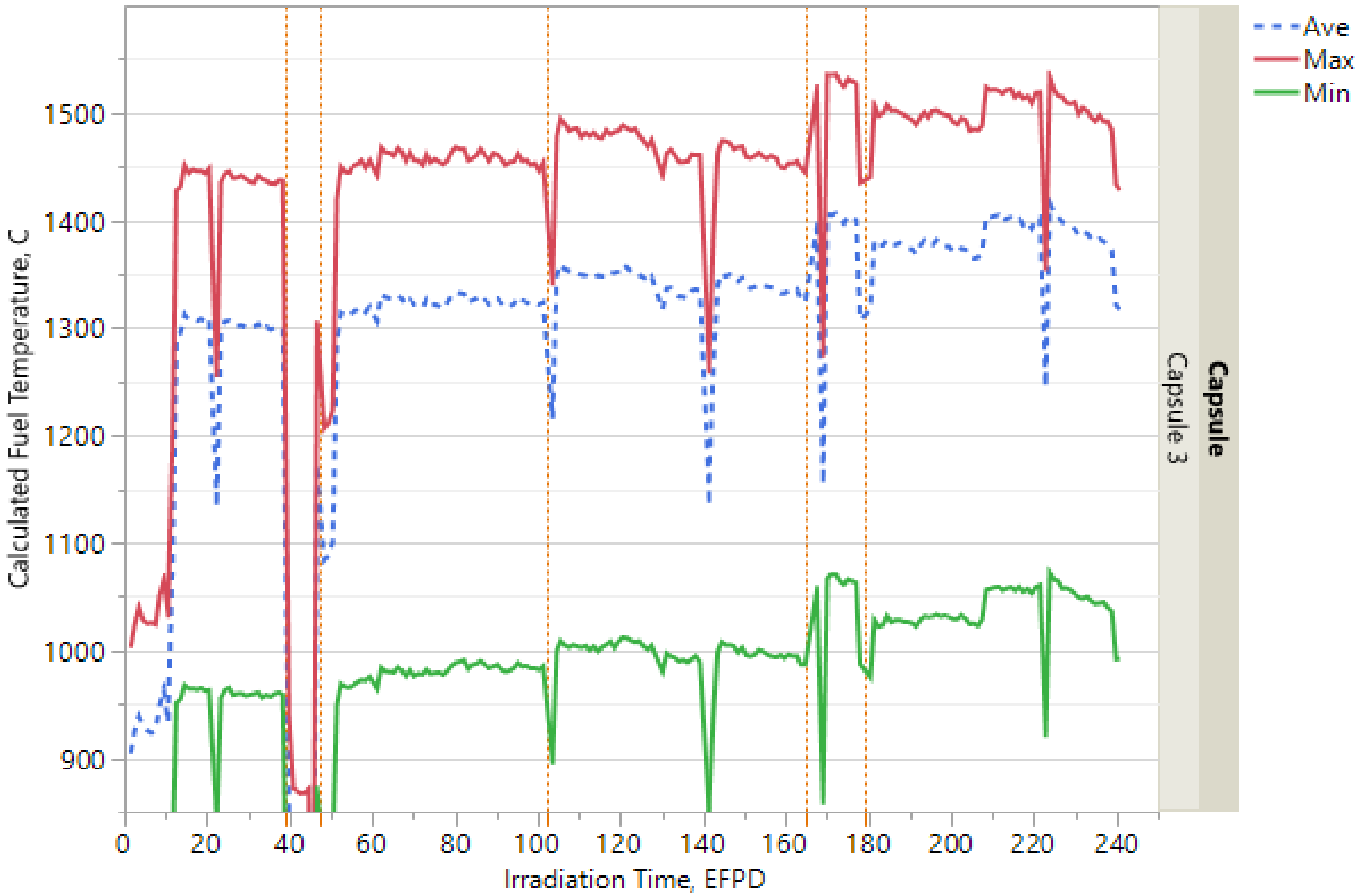
ADVANCED REACTOR TECHNOLOGIES

Capsule 1 peak and avg fuel temperatures (calculated)

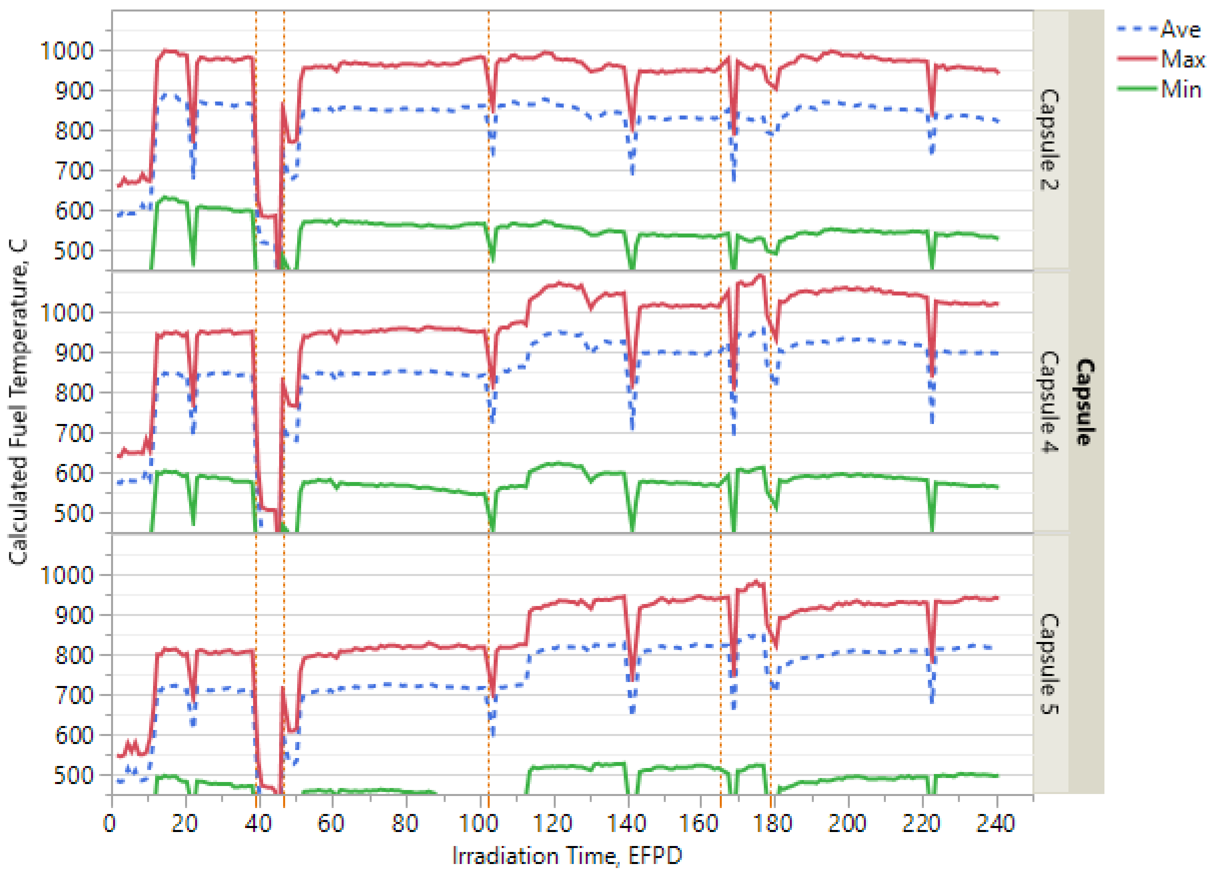


Capsule 1 inboard thermocouples consistently read 60 – 100°C higher than the model predicts. Therefore the peak temperature could be considerably under predicted.

Capsule 3 peak and avg fuel temperatures (calculated)



Capsules 2, 4, 5 peak and avg fuel temperatures (calculated)



ART ADVANCED REACTOR TECHNOLOGIES

AGR-5/6/7 Irradiation Look Ahead – Projection Method

AGR-5/6/7 peak burnup by cycle and cumulative

Original Estimate from ECAR-2961

Cycle No.	Cycle Type	Cycle Length (EFPD)	Lobe Power (MW)	Lobe Output (MWD)	Cum Lobe Output (MWD)	Filter	Peak Burnup (%)
1	Regular	50	14	700	**700**	**M**	**2.5**
2	Regular	50	14	700	**1400**	**M**	**4.9**
3	PALM	15	20	300	**1700**	**H**	**5.6**
4	Regular	50	14	700	**2400**	**M**	**7.5**
5	Regular	50	14	700	**3100**	**M**	**9.3**
6	PALM	15	20	300	**3400**	**M**	**10.0**
7	Regular	50	14	700	**4100**	**L**	**11.7**
8	Regular	50	16	800	**4900**	**L**	**13.3**
9	PALM	15	20	300	**5200**	**L**	**13.9**
10	Regular	50	18	900	**6100**	**L**	**15.5**
11	Regular	50	18	900	**7000**	**L**	**16.9**
12	PALM	15	20	300	**7300**	**L**	**17.3**
13	Regular	50	18	900	**8200**	**L**	**18.5**
Total		510		8,200	**8200**		

Actual Followed by Projected

Cycle	Cycle Length (EFPD)	Lobe Power (MW)	Lobe Output (MWD)	Cumulativ Lobe Output (MWD)	Filter	Proj Cycle Burnup (%)	Peak Burnup (%)	
Reg 162B	43	14.25	**613**	**613**	**M**		**1.95**	
PALM 163A	9	7.2	**65**	**678**	**M**		**2.0**	ACTUAL
Reg 164A	57	15.44	**880**	**1558**	**M**		**5.0**	
Reg 164B	65	16.11	**1047**	**2605**	**M**		**7.8**	
PALM 165A	14	19	**266**	**2871**	**M**	**0.62**	**8.4**	
Reg 166A	59	17	**1003**	**3874**	**L**	**2.44**	**10.9**	
Reg 166B	60	17	**1020**	**4894**	**L**	**2.04**	**12.9**	PROJECTED
PALM 167A	6	20	**120**	**5014**	**L**	**0.24**	**13.1**	
Reg 168A	60	21	**1260**	**6274**	**L**	**2.24**	**15.4**	**Cycle end**
Reg 168B	60	21	**1260**	**7534**	**L**	**1.96**	**17.3**	July 2020
PALM 169A	14	21	**294**	**7828**	**L**	**0.37**	**17.7**	Nov 2020
Reg 170A	60	21	**1260**	**9088**	**L**	**1.58**	**19.3**	Feb 2021
Total	507							

21 MW lobe powers are not currently in the ISOP.
Would need to be requested.

This slide is from the April TCT meeting

AGR-5/6/7 Irradiation Look Ahead

Actual Followed by Projected

Cycle	Cycle Length (EFPD)	Cum Days	Lobe Power (MW)	Lobe Output (MWD)	Cum Lobe Output (MWD)	Filter	Proj Cycle Burnup (%)	Peak Burnup (%)	
Reg 162B	39	39	14.25	**556**	**556**	**M**		**1.95**	
PALM 163A	9	48	7.2	**65**	**621**	**M**		**2.0**	ACTUAL
Reg 164A	57	105	15.44	**880**	**1501**	**M**		**5.0**	
Reg 164B	65	170	16.11	**1047**	**2548**	**M**		**7.8**	
PALM 165A	15	185	19	**285**	**2833**	**M**	**0.7**	**8.5**	
Reg 166A	60	245	17	**1020**	**3853**	**L**	**2.6**	**11.0**	
Reg 166B	60	305	17	**1020**	**4873**	**L**	**2.04**	**13.1**	
PALM 167A	5	310	14	**70**	**4943**	**L**	**0.14**	**13.2**	
Reg 168A	60	370	20	**1200**	**6143**	**L**	**2.1**	**15.3**	**Cycle end**
Reg 168B	60	430	20	**1200**	**7343**	**L**	**1.9**	**17.2**	Aug 2020
PALM 169A	14	444	21	**294**	**7637**	**L**	**0.37**	**17.6**	Nov 2020
Reg 170A	60	504	21	**1260**	**8897**	**L**	**1.58**	**19.1**	Mar 2021

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