3.2 METEOROLOGICAL DAMAGE

Tornadoes are rare in Rhode Island. Based on the small probability of occurrence, postulated low intensity, the intermittent type of reactor operation and low fission-product inventory, no criteria for tornadoes have been established for the RINSC structure. The RINSC reactor core is protected from damage by high winds or tornadoes by virtue of its location in the thick reinforced concrete structure surrounding the reactor tank. The superstructure of the RINSC has been designed for area wind loads including those associated with the infrequent hurricanes reaching the Rhode Island coast. The reactor building has survived past hurricanes with only light damage to the facility roof in 1991. There was no damage to the facility from the most recent hurricanes in the area: Hurricane Irene (2011) and Hurricane Sandy (2012). - Facility design also accounts for snowstorms and severe cold weather, which has not presented significant problems in the past.

3.3 WATER DAMAGE

As discussed in Chapter 2, flooding is not expected at the RINSC site. The lowest elevation at the facility is 97.0 Feet above sea level and the facility is located 550 feet from the Narragansett Bay. However, even if flooding occurred, reactor safety would not be an issue since the core is located in a water pool. In the event of a severe storm or flood, the reactor will be shut down if there appears to be even a remote chance of danger in operating the reactor at the time.

4.2.2 Control Rods

The facility has an analog rod drive system that has a digital indication of rod position. The digital system can be used to drive the analog system. The digital system is in series with the analog system.

4.3 Reactor Pool – info regarding pool leaks

Each of the beamports and the through tube have a ½" drain line associated with them for the detection of leaks. These lines come together and are collected in the basement near the make-up system and ion exchanger. This is checked daily for signs of leakage from these experimental facilities.

As part of securing the facility each day, the change in the running total volume of make-up water that has been added to the pool is recorded on RINSC Form NSC – 15 RINSC Checklist for Securing Reactor Facility. If the volume has changed by more than 100 gallons over a three day period, notify the Radiation Safety Officer. The RSO and Health Physicist shall investigate and determine the cause.

4.3.1 Reactor Pool Dam:

The reactor pool is separated into three different sections:

- High Power (HP) Section
- Middle Section
- Low Power (LP) Section

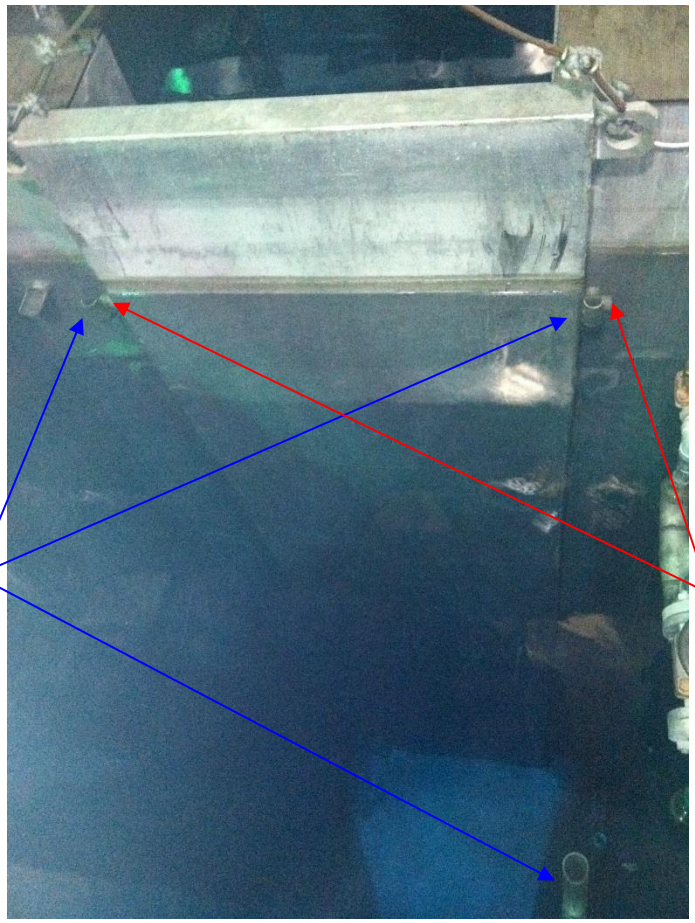
When the reactor is located in the HP Section it is coupled with the reactor forced convection cooling system and is capable of operating at full power. The reactor can be placed in the LP Section of the pool for operation adjacent to the Dry Irradiation Facility (DIF). In the LP Section the reactor is limited to a maximum power level of 100kW using natural convection cooling. The reactor will not be operated in the middle section. The reactor will not be operated with the dam in place.

The dam is normally stored on the north side of the middle section. The dam can be placed on either the east or west sides of the middle section, facing the LP or HP Sections, respectively.

The HP or LP Sections can be isolated for maintenance, repairs, or leak mitigation. Once the dam is in place the appropriate section can be drained IAW facility procedures.

The dam is 52 inches wide and 32 feet tall. There is a frame around it that is 4.5 inches thick and a rubber gasket on one side of the frame. For installation the aluminum cat walk is first removed from the pool. A guide rope is then installed on each side of the bridge and the crane hook is attached to the cable located on the top of the dam. The dam shall be positioned so that the side with the gasket is facing the side to be drained. The dam is then lowered onto the damming hooks (see image below).

Below is an image of the dam installed in the low power section of the pool.



5.7 AUXILIARY SYSTEMS USING PRIMARY COOLANT

There are no auxiliary systems that use primary coolant directly, however the Auxiliary Water Supply is related to the Primary Cooling System because it serves as an independent means of adding water to the primary loop in an emergency.

5.7.1 Auxiliary Water Supply System

The Auxiliary Water Supply System provides an independent source of water for adding water to the pool in the event of a loss of coolant accident. Water is supplied from the fire sprinkler system supply, through a series of manual valves, up to the top of the pool. Since the water from this system does not go through a clean-up system, it is for emergency use only, and can only be turned on manually. The pipe entering the pool has a diameter of 1.25 inches.

Supplemental info: The flow rate of this system is approximately 60 gpm.

Emergency Generator Loads		
Load	Run Amps	Full Load Starting Amps
Evacuation System	0.4	0.4
Generator Water Heater	0.2	0.2
Emergency Lighting	4.2	4.2
Emergency Exhaust Blower	3.5	8.9
Sump Pump	8.0	8.0
Dilution Air Blower	16.0	18.4
Stack Monitor Receptacle	5.6	5.6
Total Amps	37.9	45.7

Emergency Generator Operation Time

1. We have:

   Onan Electric Generator
   Model 15 RJC-4RB/3745A
   Serial Number 3YC7759092

2. It is rated for:

   15 kW
   18.75 kVA
   120/208 3 Phase
   4 Wire 60 Cycle AC

3. Fuel Consumption Calculation:

The attached table shows that the RINSC generator uses approximately 110 ft^3 of propane vapor per hour of operation at full load.

According to the table, the conversion between one gallon of liquid propane, and cubic feet of propane vapor is:

$$\left[\frac{1\ gallon\ Liquid\ Propane}{36.5\ ft^3\ Propane\ Vapor}\right]$$

Therefore the rate at which liquid propane is used during operation at full load is:

$$\left[\frac{1\ gallon\ Liquid\ Propane}{36.5\ ft^3\ Propane\ Vapor}\right]\left[\frac{110\ ft^3\ Propane\ Vapor}{hr}\right]$$

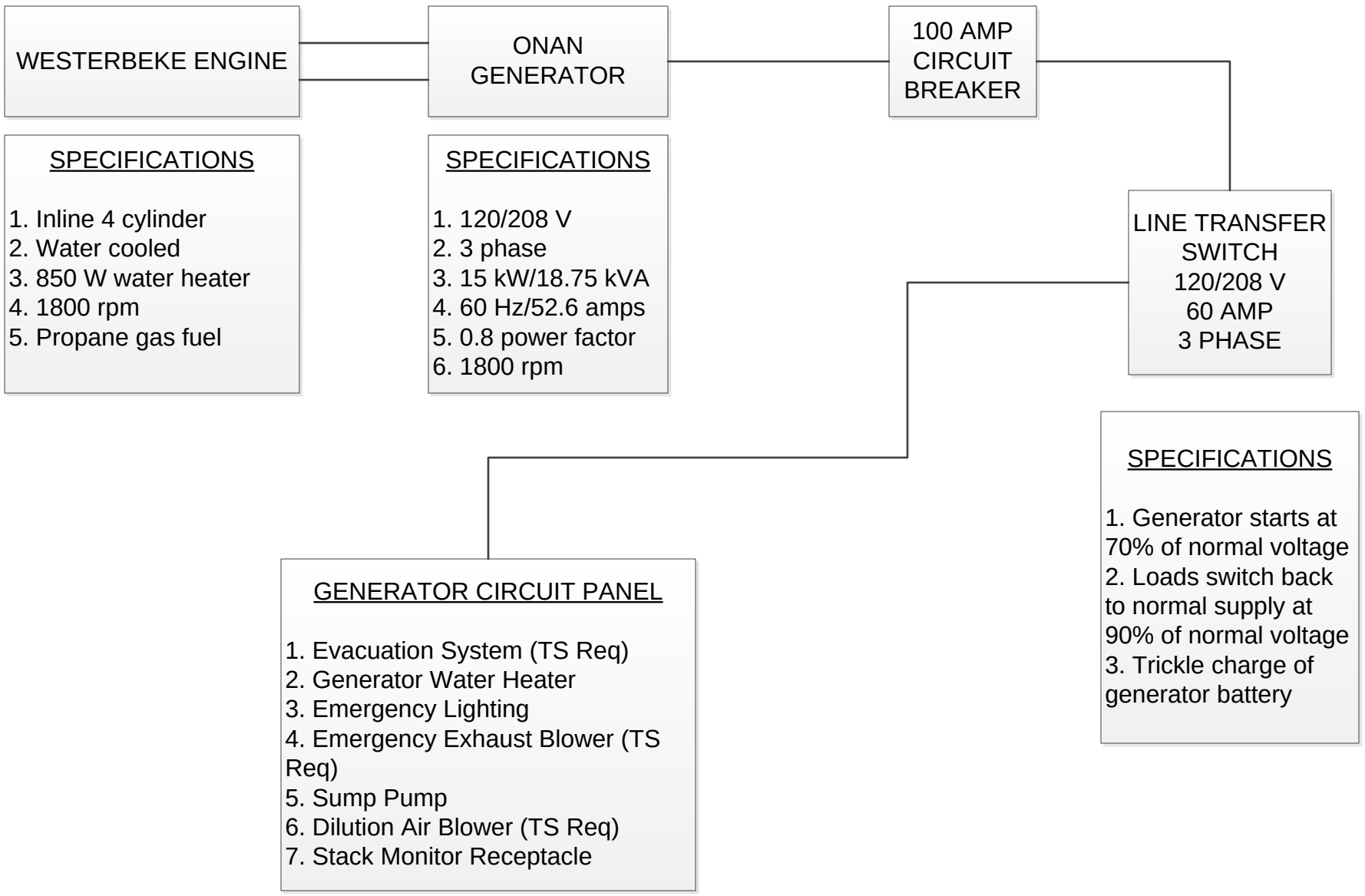
$$= \left[\frac{3.01\ gallon\ Liquid\ Propane}{hr}\right]$$

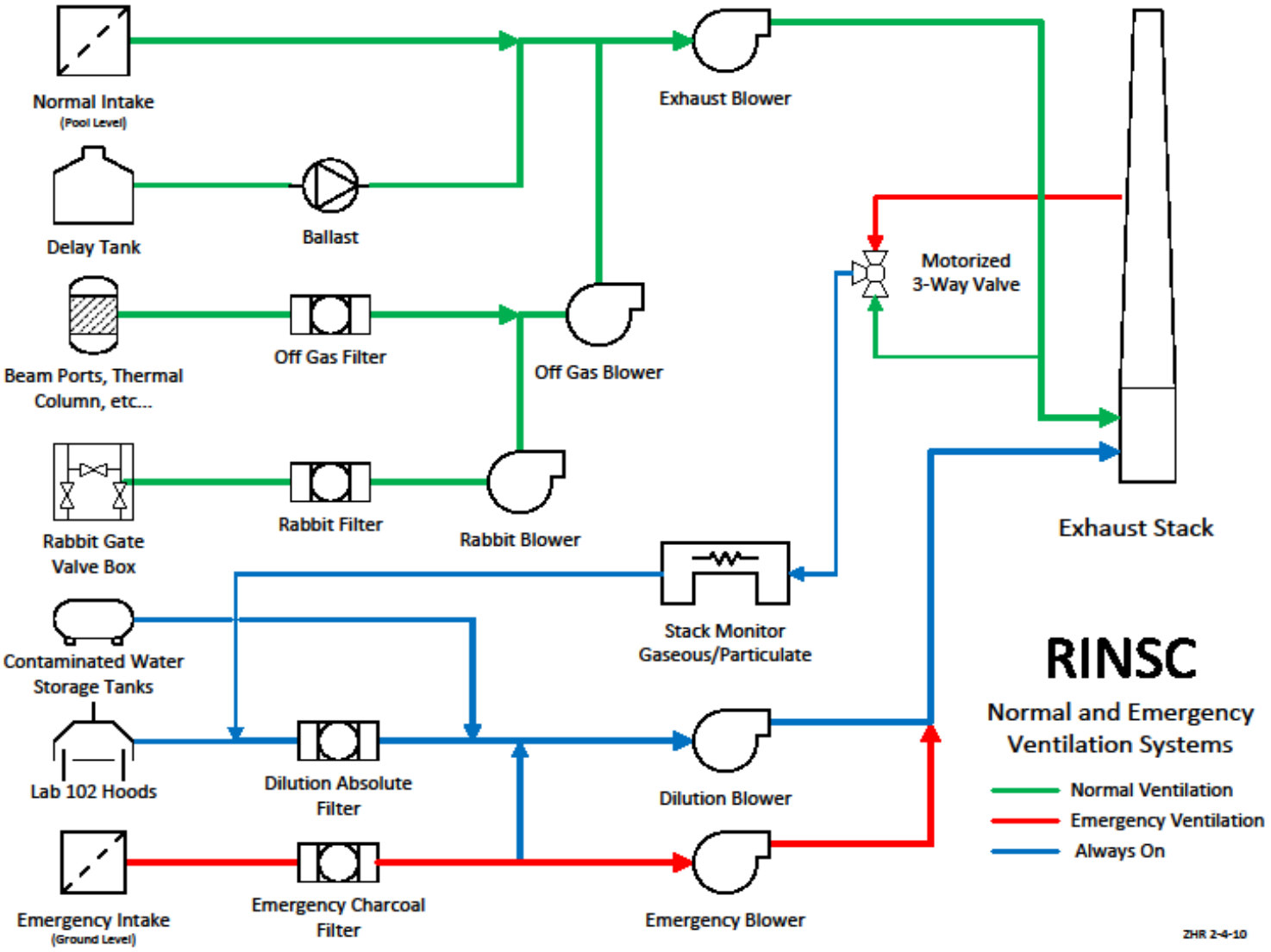
We have two propane tanks that each have the capacity for 100 gallons of liquid propane, so the maximum amount of time that the generator could operate under full load is:

$$\left[\frac{2\ Tanks}{1}\right]\left[\frac{100\ gallon\ Liquid\ Propane}{Tank}\right]\left[\frac{hr}{3\ gallon\ Liquid\ Propane}\right]$$

$$= 66.67\ hr\ of\ Operation\ under\ Full\ Load$$

4. Therefore, if the tanks are kept at least half full, there will be enough fuel to run approximately 30 hours, during which we could re-fuel if necessary.


WESTERBEKE ENGINE
ONAN GENERATOR
100 AMP CIRCUIT BREAKER
SPECIFICATIONS
1. Inline 4 cylinder
2. Water cooled
3. 850 W water heater
4. 1800 rpm
5. Propane gas fuel
SPECIFICATIONS
1. 120/208 V
2. 3 phase
3. 15 kW/18.75 kVA
4. 60 Hz/52.6 amps
5. 0.8 power factor
6. 1800 rpm
LINE TRANSFER SWITCH
120/208 V
60 AMP
3 PHASE
SPECIFICATIONS
1. Generator starts at 70% of normal voltage
2. Loads switch back to normal supply at 90% of normal voltage
3. Trickle charge of generator battery
GENERATOR CIRCUIT PANEL
1. Evacuation System (TS Req)
2. Generator Water Heater
3. Emergency Lighting
4. Emergency Exhaust Blower (TS Req)
5. Sump Pump
6. Dilution Air Blower (TS Req)
7. Stack Monitor Receptacle


Normal Intake
(Pool Level)
Delay Tank
Ballast
Exhaust Blower
Motorized
3-Way Valve
Beam Ports, Thermal
Column, etc...
Off Gas Filter
Off Gas Blower
Exhaust Stack
Rabbit Gate
Valve Box
Rabbit Filter
Rabbit Blower
Stack Monitor
Gaseous/Particulate
Contaminated Water
Storage Tanks
Lab 102 Hoods
Dilution Absolute
Filter
Dilution Blower
Emergency Intake
(Ground Level)
Emergency Charcoal
Filter
Emergency Blower
RINSC
Normal and Emergency
Ventilation Systems
Normal Ventilation
Emergency Ventilation
Always On
ZHR 2-4-10

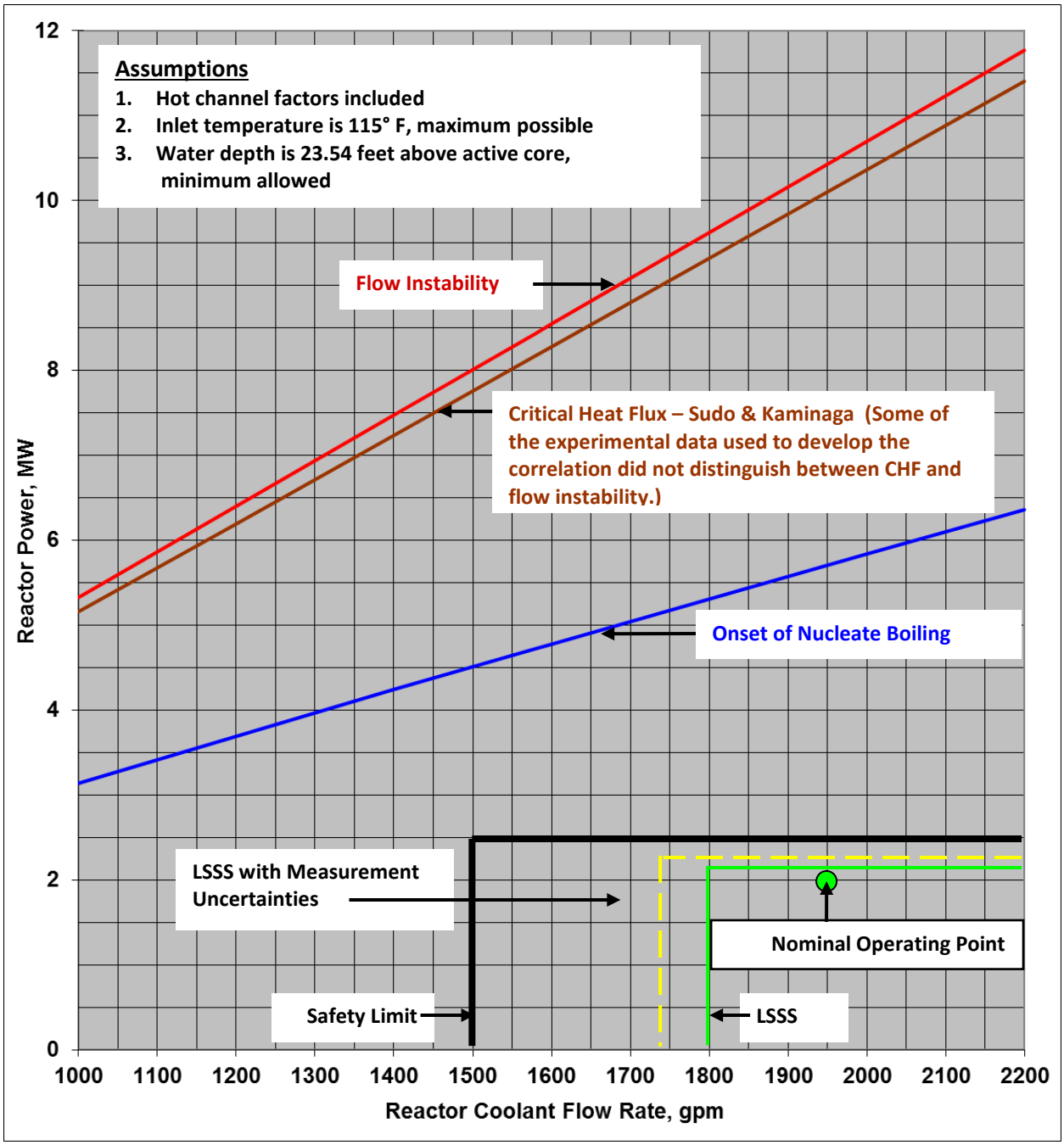


Figure 4.6-8 – Reactor Powers at Which Onset of Nucleate Boiling, Critical Heat Flux, and Flow Instability are Predicted to Occur

COMPLY: V1.6. 8/24/2016 2:32

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH

THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS

FROM THE COMPLY CODE - V1.6.

Prepared by:

RI Atomic Energy Commission
RI Nuclear Science Center
16 Reactor Rd., Narragansett, RI 02882

C. Hathaway
401-874-2600

Prepared for:

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Washington, DC 20460

COMPLY: V1.6. 8/24/2016 2:32

2016 RINSC Argon Calculations

SCREENING LEVEL 4

DATA ENTERED:

Nuclide	Release Rate (curies/YEAR)
AR-41	5.491E+01

Release height 35 meters.

Building height 15 meters.

The source and receptor are not on the same building.

Building width 18 meters.

Building length 20 meters.

STACK DISTANCES, FILE: Stack Data 2016

DIR	Distance (meters)
N	100.0
NNE	100.0
NE	100.0
ENE	100.0
E	100.0
ESE	100.0
SE	100.0

SSE	100.0
S	100.0
SSW	100.0
SW	100.0
WSW	100.0
W	100.0
WNW	100.0
NW	100.0
NNW	100.0

COMPLY: V1.6. 8/24/2016 2:32

WINDROSE DATA, FILE: 2016 WINDROSE DATA

Source of wind rose data: FSAR
Dates of coverage: 1954-1994
Wind rose location: Narragansett, RI
Distance to facility: 155m

Percent calm: 0.05

Wind FROM	Frequency	Speed (meters/s)
N	0.062	2.00
NNE	0.058	2.00
NE	0.044	2.00
ENE	0.013	2.00
E	0.012	2.00
ESE	0.013	2.00
SE	0.058	2.00
SSE	0.049	2.00
S	0.058	2.00
SSW	0.084	2.00
SW	0.105	2.00
WSW	0.064	2.00
W	0.068	2.00
WNW	0.095	2.00
NW	0.104	2.00
NNW	0.068	2.00

He produces his own VEGETABLES at home.

He produces his own MILK at home.

He produces his own MEAT at home.

NOTES:

The receptor exposed to the highest concentration is located
100. meters from the source in the NE sector.

He produces his own VEGETABLES at his home.

He produces his own MEAT at his home.

He produces his own MILK at his home.

Input parameters outside the "normal" range:

Windrose wind frequency is unusually LOW.

COMPLY: V1.6. 8/24/2016 2:32

RESULTS:

Effective dose equivalent: 1.2 mrem/yr.

*** Comply at level 4.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

********** END OF COMPLIANCE REPORT **********

****
***** GAMMA SPECTRUM ANALYSIS *****
****

File name: HPGE

Report Generated On	:	7/7/2016 4:06:17 PM
Sample Title	:	Matt Primary Sample 7/7/16
Sample Description	:	7/7/16
Sample Identification	:	
Sample Type	:	
Sample Geometry	:	
Peak Locate Threshold	:	3.00
Peak Locate Range (in channels)	:	1 - 65535
Peak Area Range (in channels)	:	1 - 65535
Identification Energy Tolerance	:	1.000 keV
Sample Size	:	9.800E+000 mg
Sample Taken On	:	
Acquisition Started	:	7/7/2016 3:32:12 PM
Live Time	:	1800.0 seconds
Real Time	:	1805.9 seconds
Dead Time	:	0.32 %

Energy Calibration Used Done On	:	7/7/2016
Efficiency Calibration Used Done On	:	9/3/2015
Efficiency ID	:	500mL Mar H2O

M. Marrapese

Primary Sample Taken 1300 7/7/16

No Cs or Iodine

Rx Last Run 7/1/16

****
***** P E A K A N A L Y S I S R E P O R T *****
****

Detector Name: HPGE
Sample Title: Matt Primary Sample 7/7/16
Peak Analysis Performed on: 7/7/2016 4:06:17 PM
Peak Analysis From Channel: 1
Peak Analysis To Channel: 4096

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	613-	622	617.15	352.05	1.28	7.20E+001	12.31	3.50E+001
2	1136-	1145	1140.82	609.25	1.55	6.42E+001	10.86	2.38E+001
3	2869-	2880	2873.96	1460.66	1.49	6.50E+001	8.52	3.00E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 1.000 sigma

****
***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****
****

Sample Title: Matt Primary Sample 7/7/16
Nuclide Library Used: C:\GENIE2K\CAMFILES\STDLIB.NLB

..... IDENTIFIED NUCLIDES .....

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi/mg)	Activity Uncertainty
K-40	0.996	1460.81*	10.67	1.03365E-004	1.38318E-005
BI-211	0.515	351.10*	12.20	2.86889E-005	4.94318E-006
		404.80	4.10		
BI-214	0.337	609.31*	46.30	1.11065E-005	1.89332E-006
		768.36	5.04		
		1120.29	17.00		
		1238.11	5.94		
		1764.49	17.00		

* = Energy line found in the spectrum.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000 sigma

****
***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****
****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/mg)	Wt mean Activity Uncertainty
K-40	0.996	1.033647E-004	1.383183E-005
BI-211	0.515	2.868888E-005	4.943177E-006
BI-214	0.337	1.110652E-005	1.893324E-006

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

********** U N I D E N T I F I E D P E A K S **********

Peak Locate Performed on: 7/7/2016 4:06:17 PM
Peak Locate From Channel: 1
Peak Locate To Channel: 4096

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide

All peaks were identified.