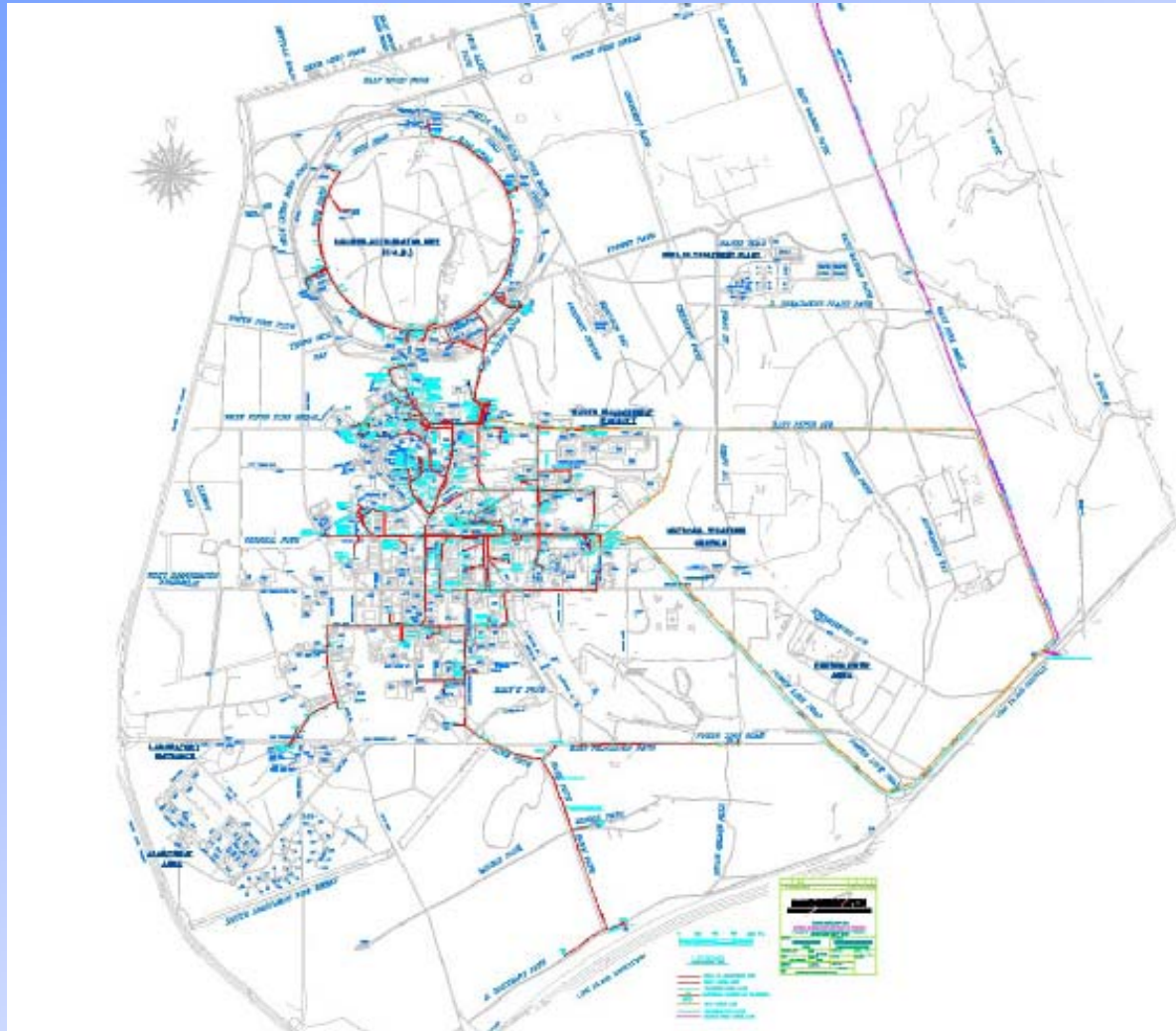

3. Existing Arc Flash Program at Brookhaven National Laboratory

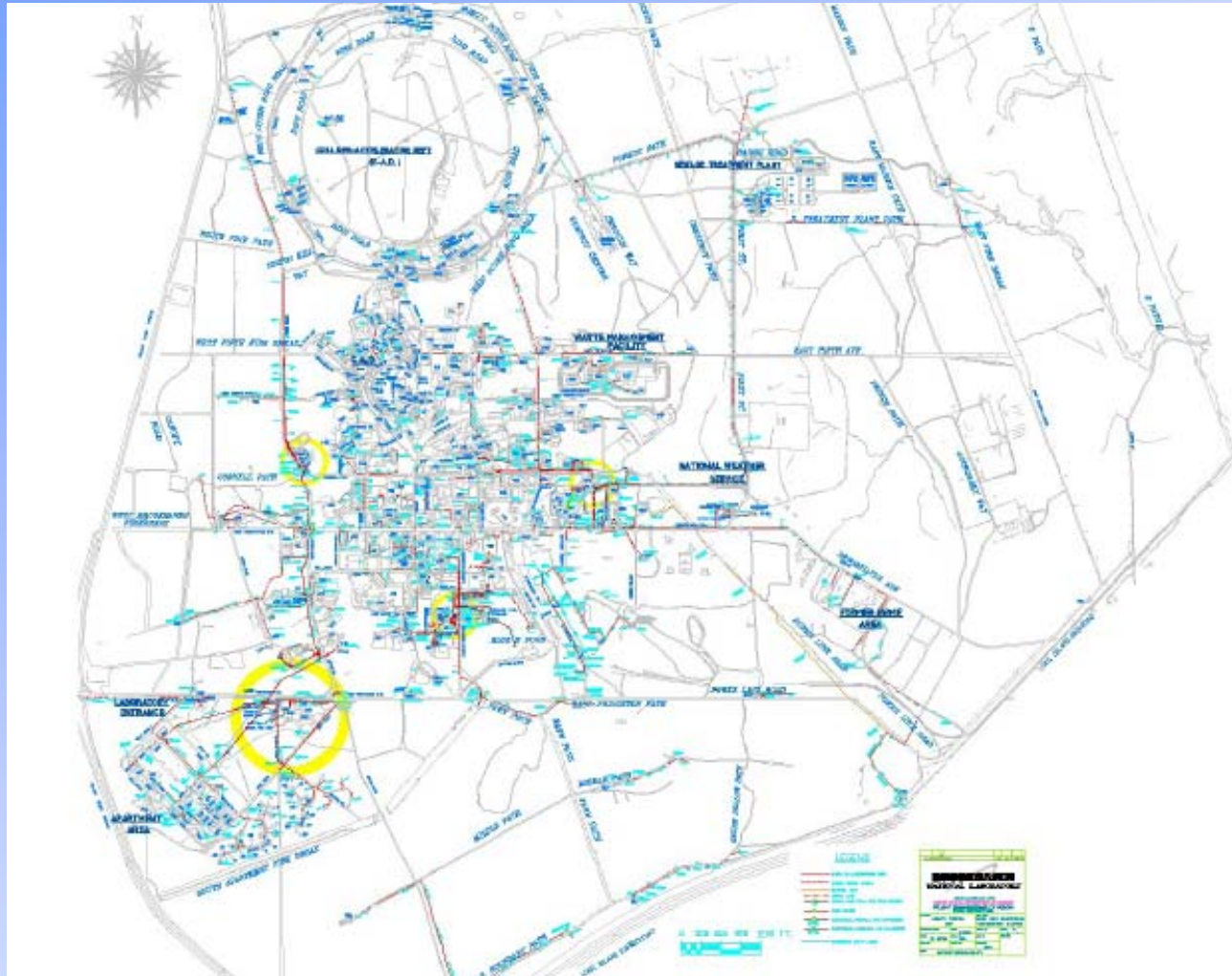
Arc Flash Analysis and Labeling

- BNL is wrapping up a 3 year effort to complete arc flash analysis and labeling of electrical distribution system.
- Includes the following three-phase distribution systems:
 - 69kV HV System
 - 13.8kV, 4.16kV & 2.4kV MV Systems
 - 480V Systems
 - 208V Lighting Panels and Circuits \geq 225 amps

69kV and 13.8kV Distribution System



2.4kV Distribution System



Brookhaven Science Associates
U.S. Department of Energy

Computer Models and Reports


- Computer models are maintained by electrical engineering
- Reports are maintained by electrical engineering
- 13.8kV Distribution System Model
- 2.4kV Distribution System Model
- Over 200 building / substation / transformer distribution system models
- Study results identified over 570 problem areas with recommendations


Labeling Effort

- Field labels have been applied to most facilities
- Labeling effort in progress

Approved Arc Flash Labels at BNL

 WARNING	
ARC FLASH HAZARD HAZARD/RISK CATEGORY 0+	
1.2 Cal/cm ²	Arc Flash Boundary - 4 Feet
REQUIRED PERSONAL PROTECTIVE EQUIPMENT	
NON-MELTING LONG SLEEVE SHIRT & PANTS	
LEATHER GLOVES	SAFETY GLASSES
<small>Calculation No:</small>	

 WARNING	
ARC FLASH HAZARD HAZARD/RISK CATEGORY 2*	
8 Cal/cm ²	Arc Flash Boundary - 6 Feet
REQUIRED PERSONAL PROTECTIVE EQUIPMENT	
COTTON UNDER GARMENTS	LEATHER GLOVES
HARD HAT w/ FACE SHIELD	LEATHER SHOES
HEARING PROTECTION	SAFETY GLASSES
FR LONG SLEEVE SHIRT & PANTS	1 or 2 LAYERS
10 CAL BALACLAVA HOOD FOR 2* OPERATIONS	
<small>Calculation No:</small>	

 WARNING	
ARC FLASH HAZARD HAZARD/RISK CATEGORY 1	
4 Cal/cm ²	Arc Flash Boundary - 5 Feet
REQUIRED PERSONAL PROTECTIVE EQUIPMENT	
HARD HAT	LEATHER SHOES
FR LONG SLEEVE SHIRT & PANTS	LEATHER GLOVES
	SAFETY GLASSES
<small>Calculation No:</small>	

 WARNING	
ARC FLASH HAZARD HAZARD/RISK CATEGORY 3	
25 Cal/cm ²	Arc Flash Boundary - 10 Feet
REQUIRED PERSONAL PROTECTIVE EQUIPMENT	
COTTON UNDER GARMENTS	LEATHER GLOVES
FLASH HOOD & HARD HAT	LEATHER SHOES
HEARING PROTECTION	SAFETY GLASSES
FR LONG SLEEVE SHIRT & PANTS	2 or 3 Layers
FR JACKET AND BIB OVERALLS OR FLASH SUIT	
<small>Calculation No.</small>	

 WARNING	
ARC FLASH HAZARD HAZARD/RISK CATEGORY 2	
8 Cal/cm ²	Arc Flash Boundary - 6 Feet
REQUIRED PERSONAL PROTECTIVE EQUIPMENT	
COTTON UNDER GARMENTS	LEATHER GLOVES
HARD HAT w/ FACE SHIELD	LEATHER SHOES
HEARING PROTECTION	SAFETY GLASSES
FR LONG SLEEVE SHIRT & PANTS	1 or 2 LAYERS
<small>Calculation No:</small>	

 WARNING	
ARC FLASH HAZARD HAZARD/RISK CATEGORY 4	
40 Cal/cm ²	Arc Flash Boundary
REQUIRED PERSONAL PROTECTIVE EQUIPMENT	
COTTON UNDER GARMENTS	LEATHER GLOVES
FLASH SUIT w/ HOOD & HARD HAT	LEATHER SHOES
HEARING PROTECTION	SAFETY GLASSES
FR LONG SLEEVE SHIRT & PANTS	2 or 3 LAYERS
<small>Calculation No:</small>	

Hazard/Risk Category Larger than 4



Short Circuit Rating < the Available Fault Current



Potential Cubicle Labels



480V Switchgear



480V Motor Control Center

208V Examples



208V Lighting
Panel



208V < 225A
Disconnect Switch

Switch Out of Service



480V Disconnect Switch