Powering Safety: How Blue Ridge Engineering Cut Arc Flash Risk by Over 90%

The Challenge

An industrial facility faced extremely high arc flash incident energy levels—some over 70 cal/cm²—across its main electrical switchboards. Not only did this exceed NFPA 70E safety thresholds, but it made routine maintenance dangerous and complex. Meanwhile, the electrical system lacked modern reliability features like transfer switches, remote operation, and coordination logic.

The High-Level Solution

Blue Ridge Automation's engineers designed and implemented a solution that:

- Lowered all incident energies to below 8 cal/cm²
- Enhanced personnel safety and system maintainability
- Enabled remote breaker operation and fast generator connection

At a Glance: Project Results

Objective	Before	After
Incident Energy (SWBD-2)	44 cal/cm²	3.1 cal/cm²
Incident Energy (MDP-1)	54.2 cal/cm²	4.7 cal/cm²
Incident Energy (MDP-FP)	38.9 cal/cm²	2.9 cal/cm²
Incident Energy (MSB-3)	74.6 cal/cm²	4.7 cal/cm²
NFPA 70E Compliance	❌ Exceeded 8 cal/cm² limit	✅ Below 8 cal/cm² across all boards
System Resilience	No redundancy / manual backup only	Remote control + Generator-ready MTS

Electrical System Overview

The facility has four utility feeds at 12.47 kV, feeding five different 480V switchboards via stepdown transformers:

100 UTIL
1000 kVA → MDP-1 and SWBD-2

200 UTIL
1500 kVA → SWBD-3

300 UTIL
500 kVA → MDP-6 (Office/Loadout)

400 UTIL
225 kVA → R-LO MDP-1

Design Alternatives Considered

Option	Description	Pros	Cons
CURRENT LIMITING FUSES (CLF)	Install CLF ahead of main breakers	Fast-acting fault protection	Coordination complexity
ULTRA-FAST EARTHING SWITCH (UFES)	Uses arc detection + 3-phase grounding	Rapid arc quenching (<4ms)	Expensive, space-limited
EXTERNAL MAIN SERVICE EQUIPMENT	New LSIG breakers, ERMS, MTS	Precise coordination, remote ops, generator-ready	Higher initial install scope

External Main Service Equipment

The third option was selected for its comprehensive safety features, flexibility, and ease of implementation.

Key safety features included advanced LSIG circuit breakers, which effectively coordinated with the existing system and reduced incident energy levels to below 8 cal/cm²—enhancing protection for personnel. In addition, the breakers' ERMS (Energy Reduction Maintenance Setting) allowed for faster fault clearing during maintenance, further lowering arc flash hazards in compliance with NFPA 70E-2024 standards.

To minimize exposure to energized equipment, remote breaker control was added, enabling operators to safely open and close breakers from outside the arc flash boundary. The system also included a manual transfer switch with Cam-Lok connectors for quick, easy connection to an emergency generator, supporting reliable backup power.

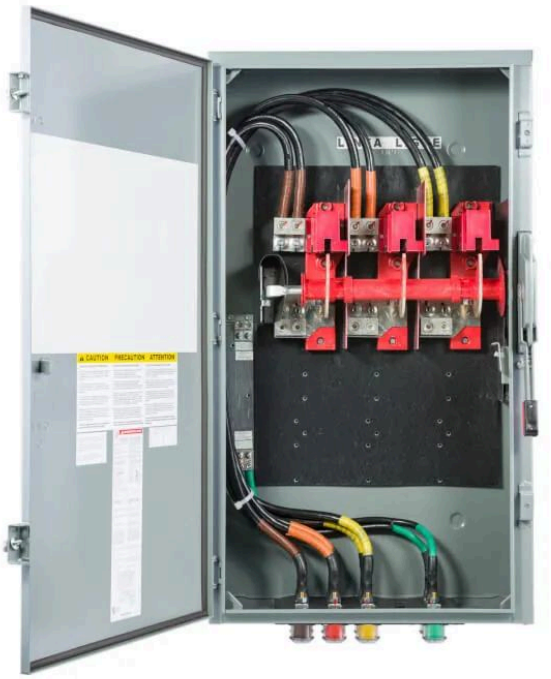
Overall, this solution delivered on two critical goals: improving worker safety and ensuring fast, reliable power restoration during outages.

Arc Flash Study Results

	System 1: 100 UTIL (1000 kVA)		System 2: 200 UTIL (1500 kVA)	
Location	MDP-1	SWBD-2	SWBD-3	MDP-FP
Existing Gear:	GE SK MET 1200A	GE SKLA Spectra 800A	Eaton RG-Frame 310+ 2000A	Siemens HJXD6A 400A
New Design:	1200A MTZ breaker with ERMS	800A MTZ breaker	1200A MTZ breaker with ERMS	Siemens HJXD6A 400A
Incident Energy (Before → After)	54.2 → 4.7 cal/cm²	44 → 3.1 cal/cm²	74.6 → 4.7 cal/cm²	38.9 → 2.9 cal/cm²

The Takeaway

Blue Ridge delivered a comprehensive solution that brought the facility into full NFPA 70E compliance, dramatically reducing arc flash risk while improving power reliability and maintenance safety.



LSIG

Long, Short, Instantaneous, Ground Circuit Breakers
Enable proper coordination and selective fault clearing.

Remote Breaker Operation Panels

Allow staff to safely operate breakers from outside arc flash boundaries.

ERMS

Energy Reduction Maintenance Settings
Minimizes trip delay during maintenance per NFPA 70E-2024.

MTS

Manual Transfer Switch + Generator Cam-Lok
Enables fast, safe generator connection.

Client Benefits

- **Incident energy** reduced to **below 8 cal/cm²** across all switchboards
- **Maintenance made safer** through remote breaker operation and ERMS trip settings
- **Reliable power** ensured with LSIG coordination and generator-ready infrastructure
- **Downtime minimized** thanks to fast transfer capabilities and smart system design

The Result:

A safer, more reliable power system designed not just for today's standards—but for tomorrow's challenges.

Ready to Elevate Your Power System?

From reducing arc flash risk to modernizing infrastructure, Blue Ridge's electrical engineering solutions are designed to keep your people protected and operations optimized.

Let's design smarter, safer systems—together.

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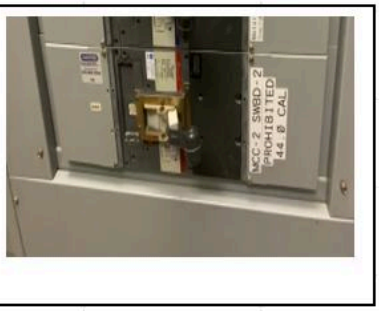
DETAILS OF THE DESIGN/CALCULATIONS EXAMPLES:

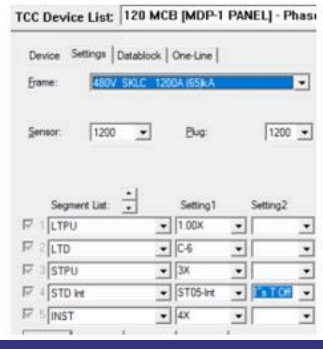
1 100 UTIL, 1000 kVA feeding MDP-1 and SWBD-2

The Current installed breaker for MDP-1 is GE SK MET 1200A. The Process Switchboard SWBD-2 has a GE SKLA Spectra 800A. The new equipment ahead of MPD-1 is designed to have a 1200A MTZ breaker with ERMS, and ahead of SWBD-2 is designed with 800A MTZ breaker.



Current Installation Incident Energy @ Incoming to Process Switchboard: 44 cal/cm2 - Breaker setting is @ MAX

Current Installation Incident Energy @ Incoming to MDP-1: 54.2 cal/cm2



Adding the new service equipment with an MTZ Breaker (ahead of the existing breaker), reduced the incident energy at incoming of SWBD-2 from 44 to 3.1 cal/cm2

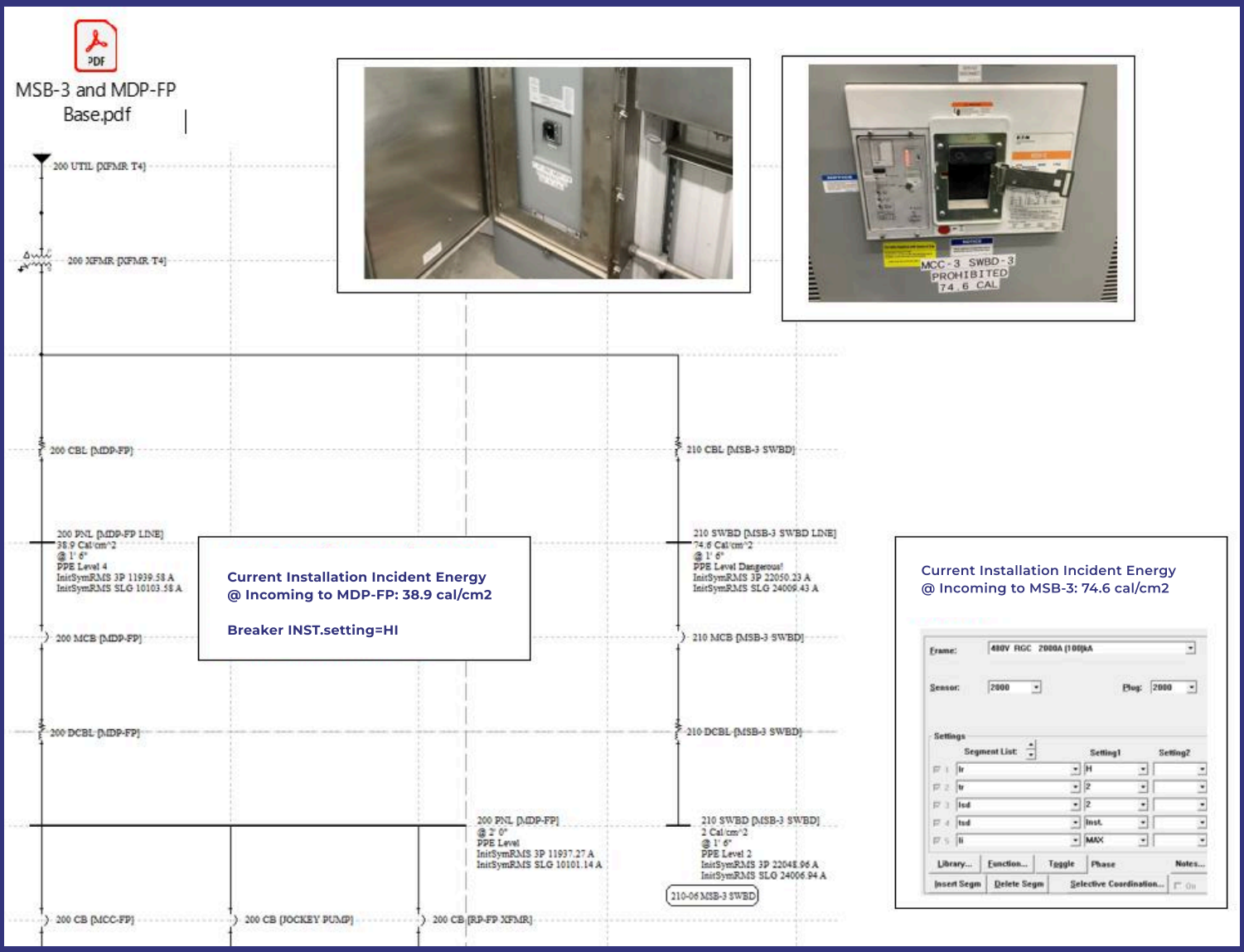
(Note this requires some settings adjustments to existing main breaker.

Adding the new service equipment with an MTZ Breaker (ahead of the existing breaker),reduced the incident energy at incoming of MDP-1 from 54.2 to 4.7 cal/cm2

DETAILS OF THE DESIGN/CALCULATIONS EXAMPLES:

1 200 UTIL, 1500 kVA feeding SWBD-3 and MDP-FP

SWBD-3 (or MSB-3) currently has a 2,000A Eaton RG-Frame 310+ and MDP-FP has a Siemens HJXD6A 400A Breaker.



Adding the new service equipment with an MTZ Breaker (ahead of the existing breaker), reduced the incident energy at incoming of MDP-FP from 38.9 to 2.9 cal/cm2.

Note however that the existing 400A breaker and new MTZ Breaker have overlap in the existing settings. The 400A MTZ breaker is at its maximum settings. To get a better coordination the existing Main breaker can be changed from an INST of MAX to LOW.

Adding the new service equipment with an MTZ Breaker (ahead of the existing breaker), reduced the incident energy at incoming of MSB-3 from 74.6 to 4.7 cal/cm2