



Solutions for safe, smart and sustainable electrification

Enhancing human safety and equipment reliability



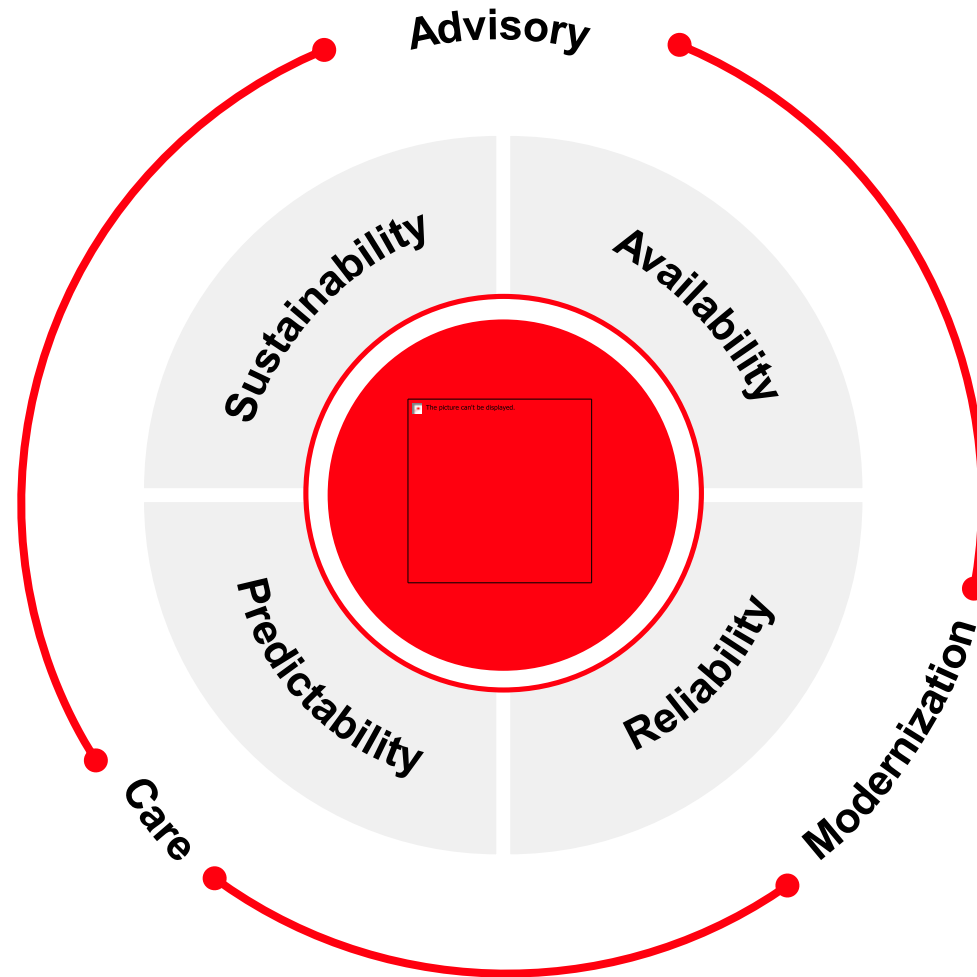


Electrification Service Division

Our portfolio of solutions

Electrification Service Division

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Electrification Service Division

Enabling sustainability, availability reliability and predictability

Offer	Care services	Modernization services	Advisory services
	Installation and commissioning Training Spare parts, repairs & maintenance	Extension, upgrades and retrofits End-of-life services Replacement	Engineering and consultation Advanced services Power care
Service categories			
How can you reach us?	Via our business partners		
	Direct		

MV Modernization Solutions

- Circuit breaker retrofits
- Motorized racking



Circuit breaker retrofits

Enhancing life of existing switchgear

Circuit breaker retrofit

Definition

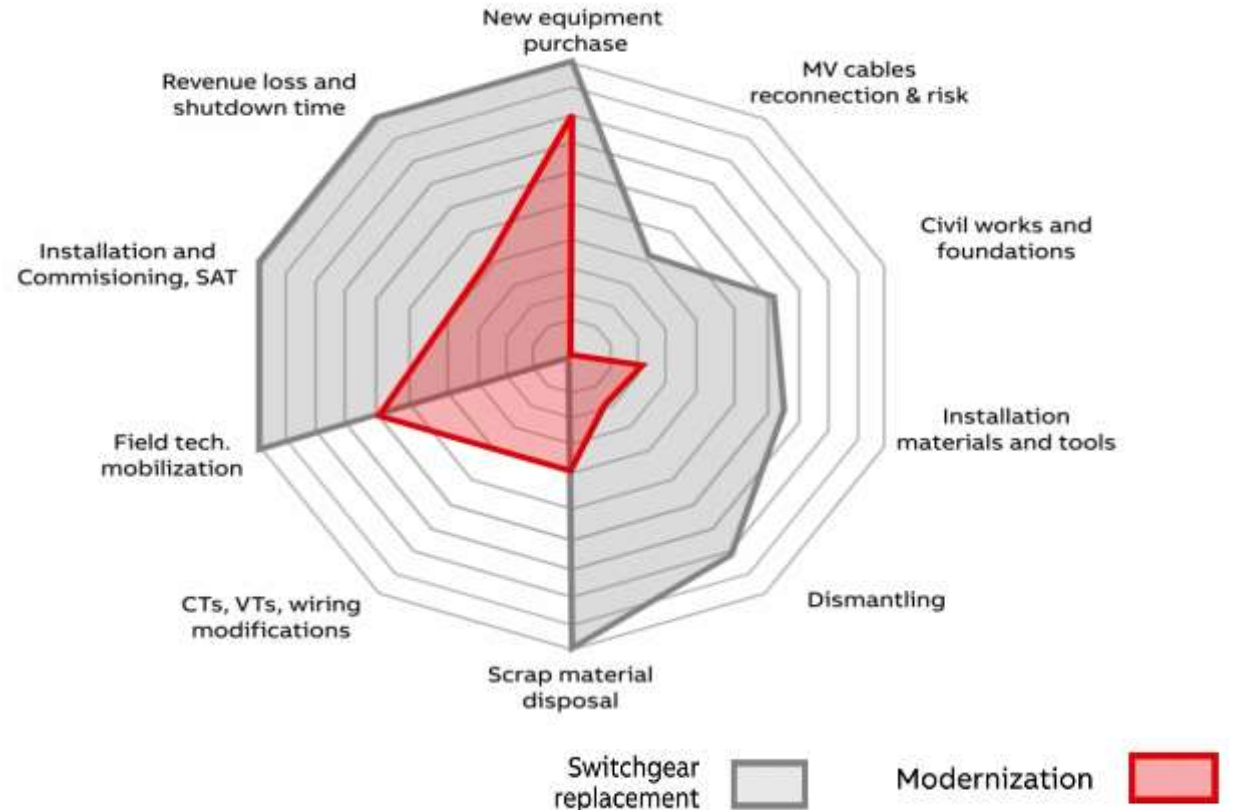
- Retrofit = the replacement of original obsolete components in existing installations by latest state-of-the art components
- Modernization with circuit breaker retrofitting is a cost-effective alternative to complete switchgear replacement
- Retrofitting constitutes replacement of circuit breaker having similar or advanced features for
 - Life extension
 - Reduced maintenance
 - Improved functionality
- The following basic details are necessary for providing standard retrofit solutions:
 - Technical information from the data label
 - Pictures from all four sides & compartment inner pictures
 - Existing panel schematic diagram
 - Dimension details

Circuit breaker retrofit

Replacement v/s modernization – Total efforts comparison

Circuit breaker retrofitting is a cost-effective alternative to complete switchgear replacement

Total efforts comparison between modernization and complete switchgear replacement



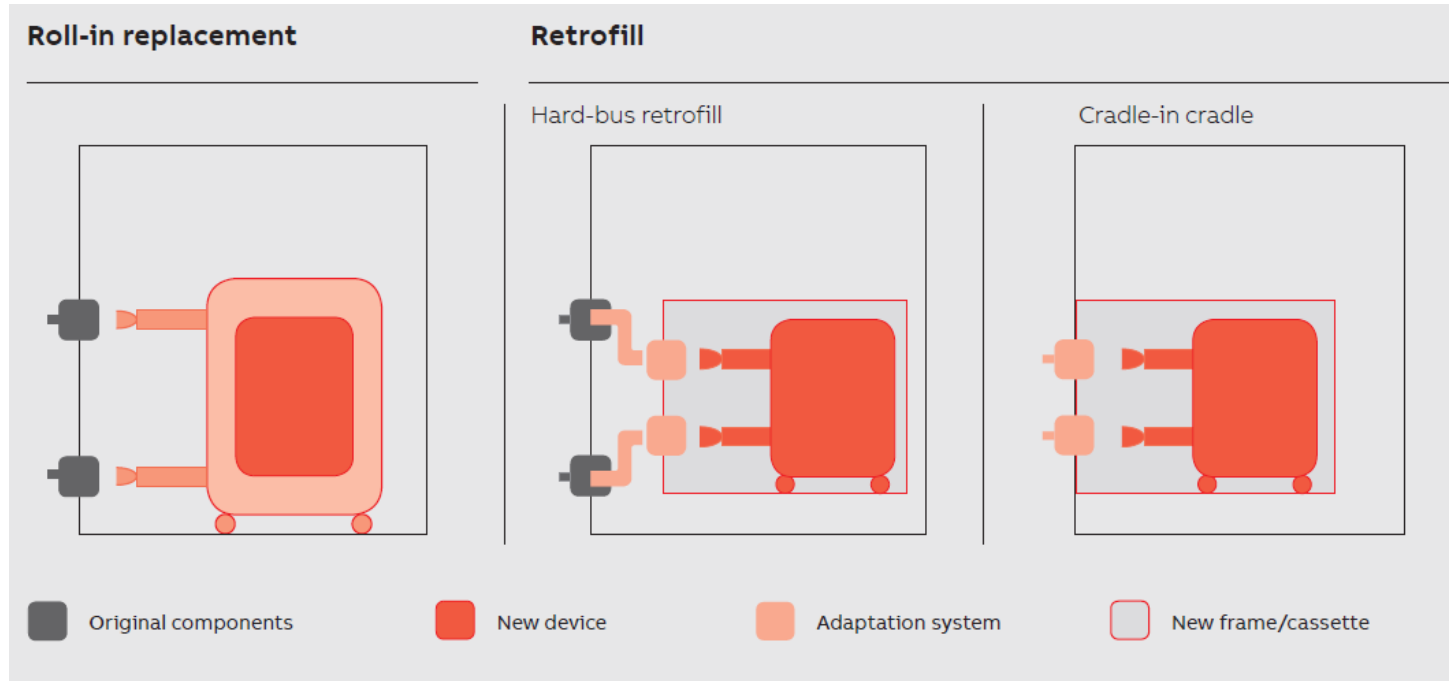
MV Circuit Breaker Upgrade

MV Retrofit Solutions that are suitable for various needs which have been developed for more than 20 years.

Roll-in replacement solutions are designed to ensure the original breaker is upgraded with minimum downtime saving time and extending life cycle of switchgear.

Retrofill Solutions are designed to not only upgrade of the Circuit Breaker but to improve the safety condition of the Circuit Breaker Compartment. Standardized and type tested solutions such cradle enable upgrade of the compartment as well as conformance to IEC standards.

Digitalization is possible by integrating temp sensors to the solutions aswell as supplying additional safety upgrades that allow remote operation.



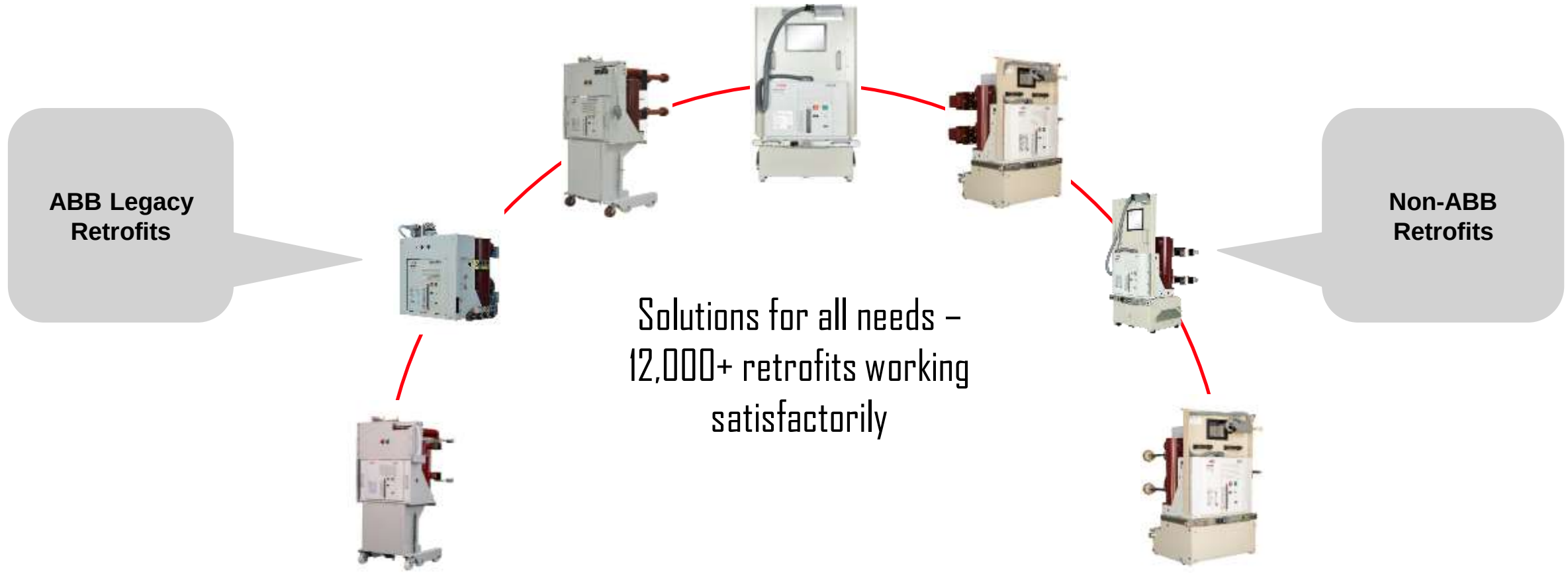


Circuit breaker retrofits

Roll-in replacement

Circuit breaker retrofit

Roll-in replacements





Circuit breaker retrofits

Cradle solution

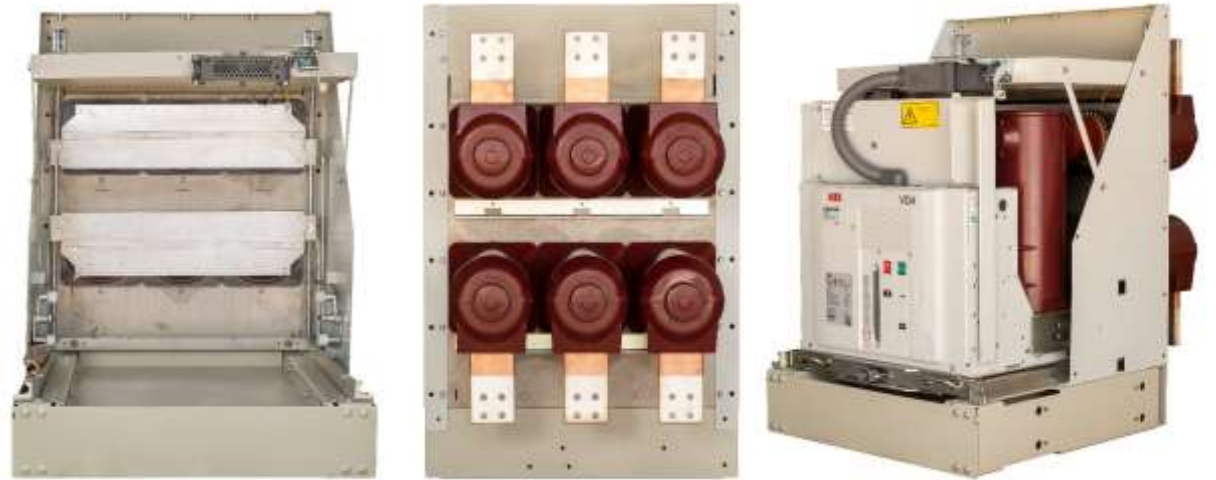
Circuit breaker retrofits

Cradle solution – Concept

Cradle is one of the retrofit technical solutions used by ABB. It is the latest ABB retrofit design concept in order to easily connect the new breaker to a wide range of existing non-ABB panels.

Concept: Cradle solution comprises a frame that hosts a standard circuit-breaker connected to the existing switchgear by an adaptation system.

The adaptation system allows a completely standard ABB withdrawable apparatus to be fitted to the original switchgear. The result is a great improvement in reliability, safety, maintenance and performance.



12kV Cradle retrofit solution for non-ABB circuit breakers

Circuit breaker retrofits

Cradle solution – Construction

Fixed part: which consist of the fabricated structure of the cradle, housing bushing assemblies, shutter mechanism assembly along with the guide rails for CB racking IN OUT operation

Withdrawable part: Standard circuit breaker from VD4 family of ABB CBs

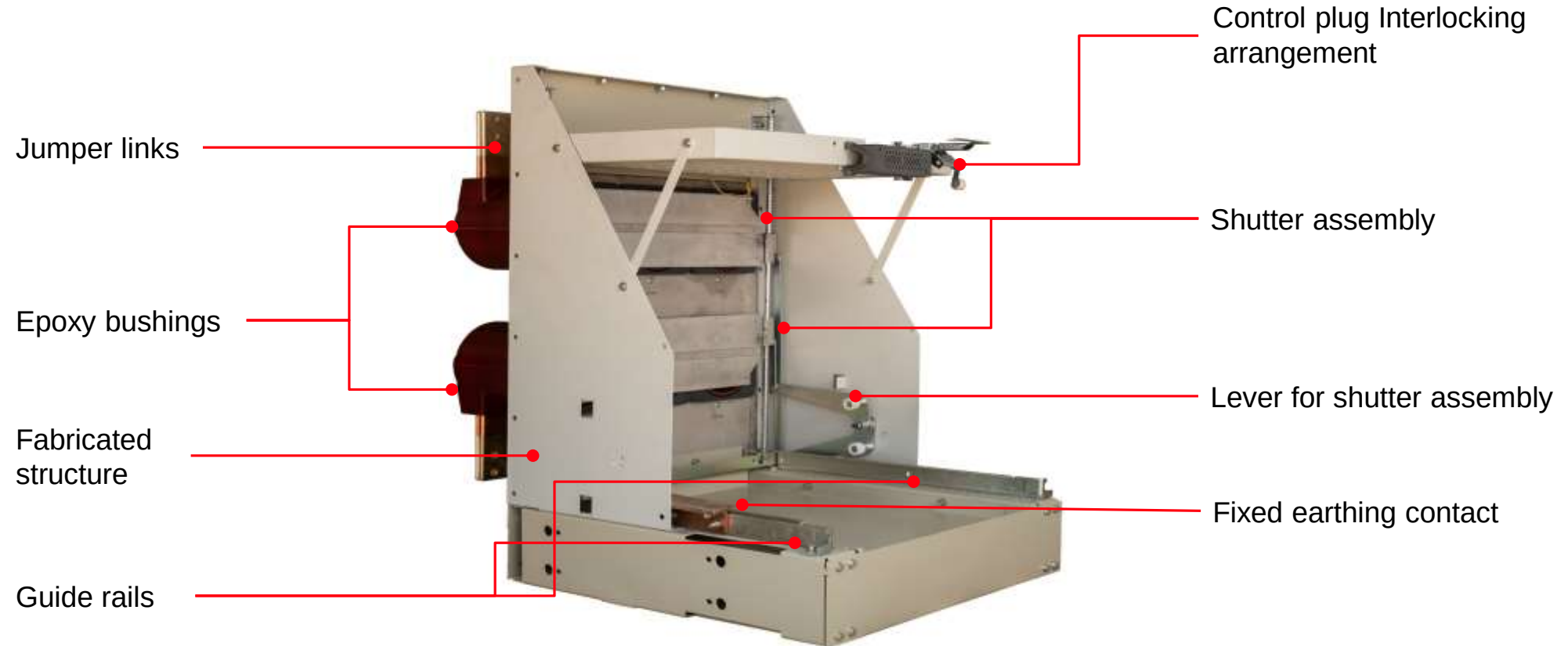


Adaptation: Adapted on case-to-case basis for integrating the cradle in existing switchgear



Circuit breaker retrofit

Cradle solution – construction (fixed part)



Circuit breaker retrofit

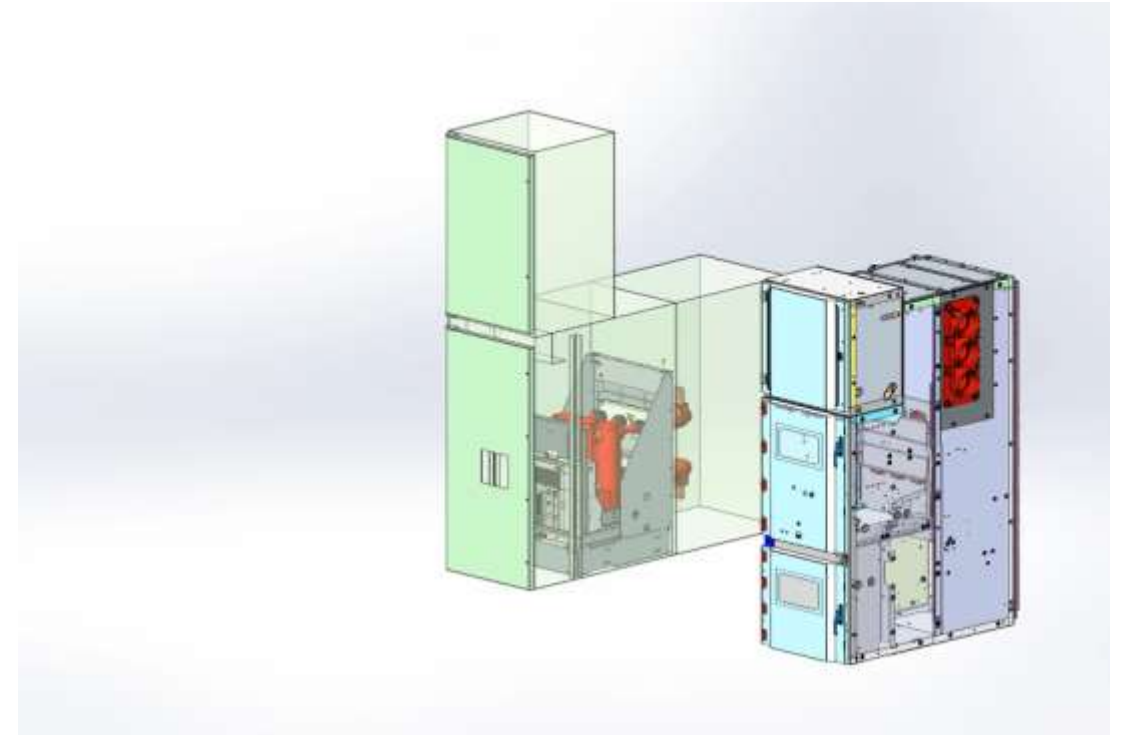
Cradle solution – construction (withdrawable part)



Circuit breaker retrofit

Cradle solution - Benefits

- **Maintenance and repair aspect:**
 - The new CB mounts all standard spare parts with all the benefits in terms of delivery time and price
 - Equipment and spare parts are interchangeable with new ABB extension panels (UniGear) and additional switchgear ¹⁾
 - Same operational interface and maintenance approach for the equipment installed in Cradle and new ABB panels
- **Modernization process:**
 - The use of standard breakers makes them ready without any modification for future ABB replacement switchgear, providing an optimized investment for the next substation renewal ¹⁾
- **Ease of use:**
 - Modular operating mechanism
 - Inbuilt spring charging handle for CBs



1) For same type, rating and frame size of assembled pole circuit breaker

Circuit breaker retrofit

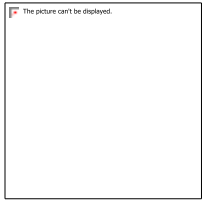
Cradle solution - Benefits

- **Safety upgraded:**
 - The original shutter system and all the relevant interlocking are replaced with new standard ones installed from the factory on the Cradle solution
 - Shutter and circuit breaker movement are interlocked to enable all necessary safety features
 - Integrated with interlock preventing removal of control plug in service position of CB
 - Option for in built remote racking of CB
 - Optionally integrated with temperature monitoring sensors near apparatus spouts
- **Technology:**
 - Cradle solutions are fully type tested according to IEC 62271-1



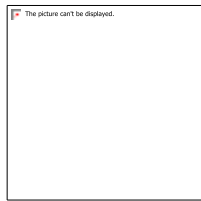
Circuit breaker retrofit

Cradle solution – Values



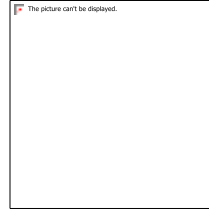
Safety

- + Perfect choice for safety of the user



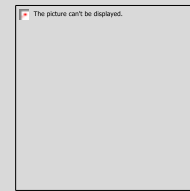
Sustainability

- + CO₂ savings by retaining original panel and reduced landfill



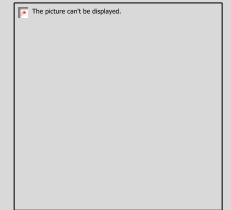
Predictability

- + Integration of standard digital solutions



Reliability

- + Upgrade of MV ageing MV CB and compartment



Availability

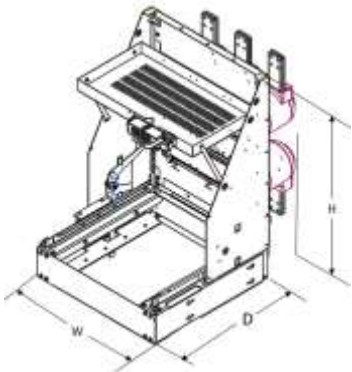
- + Usage of standard ABB CB and accessories interchangeable with CB in UniGear ZS1

Circuit breaker retrofit

Cradle solution – Technical data

Technical data

Details/Type	Unit	CRS1	CRS11	CRS21	CRS31	CRS41	CRS51
Rated voltage	[kV]	12	7.2; 12	12	12	12	12
Rated current (40 ⁰ c)	[A]	800...1250	1250	1600	2000	2500	3150 ¹⁾
Rated power frequency withstand voltage	[kV 1 min]	28	20; 28	28	28	28	28
Rated lightning impulse withstand voltage	[kVp]	75	60; 75	75	75	75	75
Rated frequency	[Hz]	50	50	50	50	50	50
Rated short time withstand current	[kA 3 s]	...31.5	40	40	40	40	40
Peak current	[kAp]	...78.75	100	100	100	100	100
Overall dimensions	H [mm]	1098	1098	1098	1098	1098	1098
	W [mm]	596	596	746	746	746	746
	D [mm}	954	975.5	1003	1003	1003.5	1032

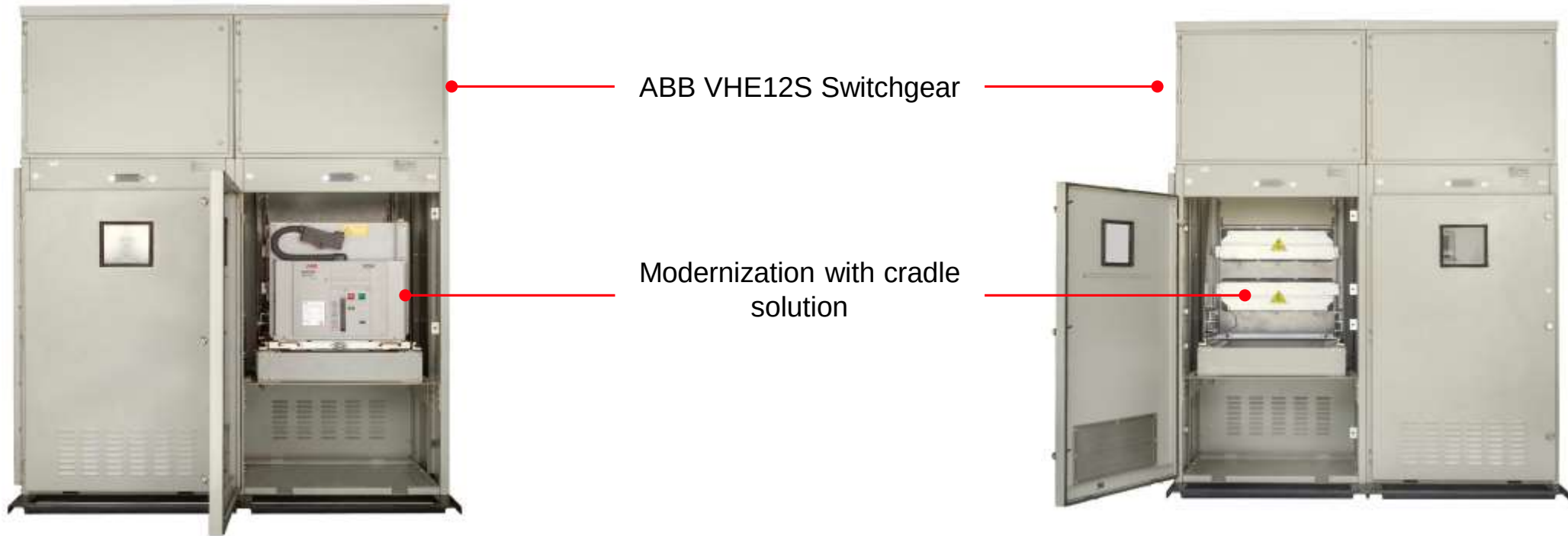


1) With forced ventilation

Circuit breaker retrofit

Cradle solution – Example with ABB VHE12S panel

ABB VHE12S panel retrofitted with cradle solution



Circuit breaker retrofit

Cradle solution – Example with non-ABB panel

Existing switchgear



Retrofitting with cradle



Adaption system



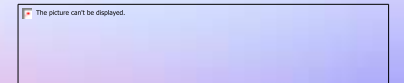
CB transport trolley



Non-ABB panel retrofitted with 12kV cradle solution

NEXT GENERATION CB RACKING SOLUTIONS

Transforming electrical safety and operational efficiency



The status quo

Manual racking challenges

1. High Risk of Arc Flash



Operators work in close proximity of energized equipment, dramatically increasing exposure to dangerous arc flash incidents that can reach temperatures hotter than the sun's surface.

2. Physical Strain & Injury



Manual racking requires significant physical effort and awkward positioning, leading to potential muscular injuries, back strain, and long-term health issues for maintenance personnel.

3. Inconsistent Operation



Human error and varying operator strength can result in improper racking alignment, causing equipment damage, operational failures, early component wear and compromising mechanism and interlock integrity.

4. Limited Access



Difficult to safely racking breakers in confined spaces, contaminated areas, or during emergency situations when every second counts.

CB racking procedures

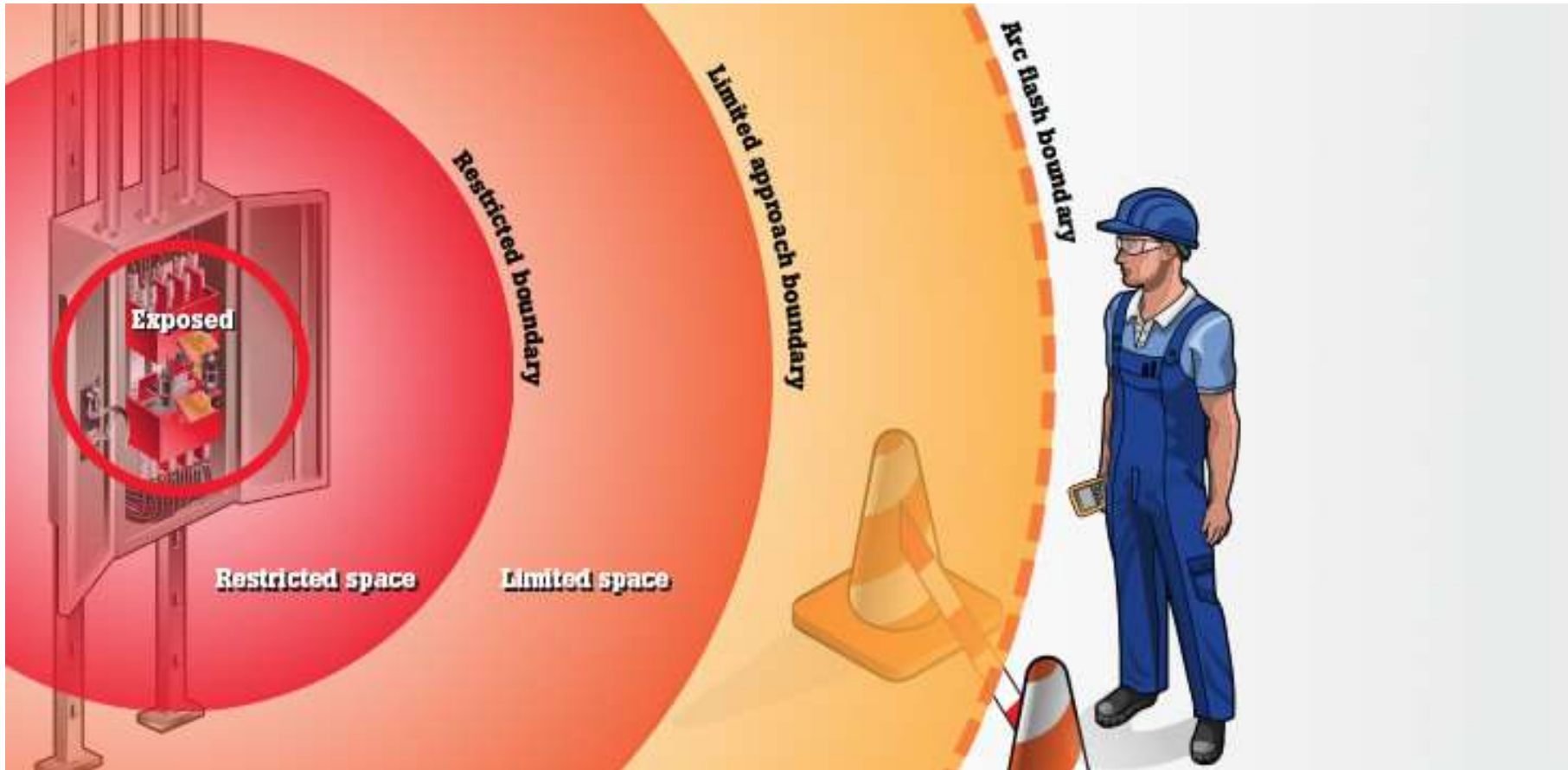
Close proximity, high risk & significant physical efforts

Operators must work within inches of energized equipment, facing potential arc flash hazards while managing heavy mechanical loads.



CB racking procedures

High risk of arc flash



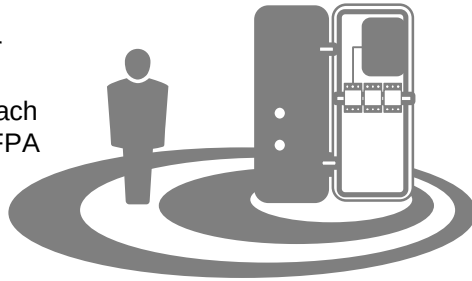
Operators must enter "Restricted space" for racking operation

CB racking

High risk of arc flash

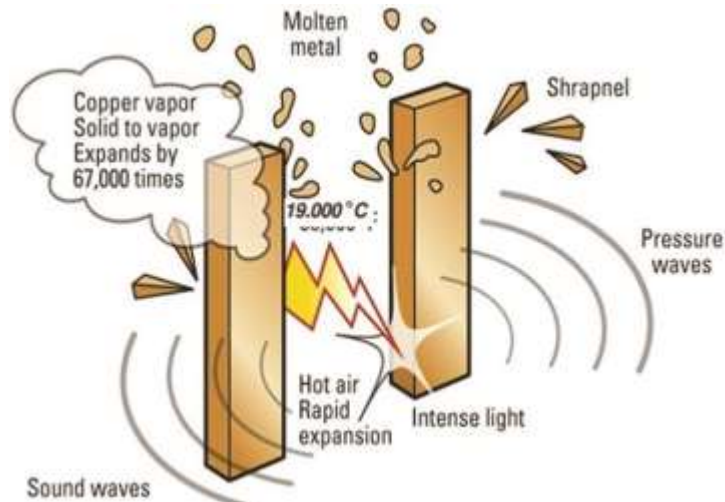
Manual racking

Personnel must enter arc flash zone.
2000 injuries occur each year according to NFPA



~300 ANNUAL DEATHS IN US ALONE ARE CAUSED BY ENERGIZED ELECTRICAL EQUIPMENT

80% OF ALL ELECTRICAL ACCIDENTS ARE CAUSED BY ARC FLASH INCIDENTS



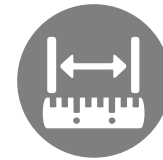
19,000°C (35,000° F) Hotter than you can imagine
Arc Flash temperatures are hotter than the sun.



1,100kmph (700 mph) Projectile-producing pressure
Arc flash can throw workers across a room. Metal and equipment become shrapnel.



+2,000 burns More than one way to burn you
According to NFPA, each year 2,000+ people seek treatment for serious Arc flash burns.



3 meters (10 feet) Too close for comfort
Arc flash can reach out 3 meters to take a life. Serious-injury zone is even larger.



140 dB An assault on your senses
Light and sound bursts can cause vision and hearing loss.

Hazard mitigation strategies

Hierarchy of controls

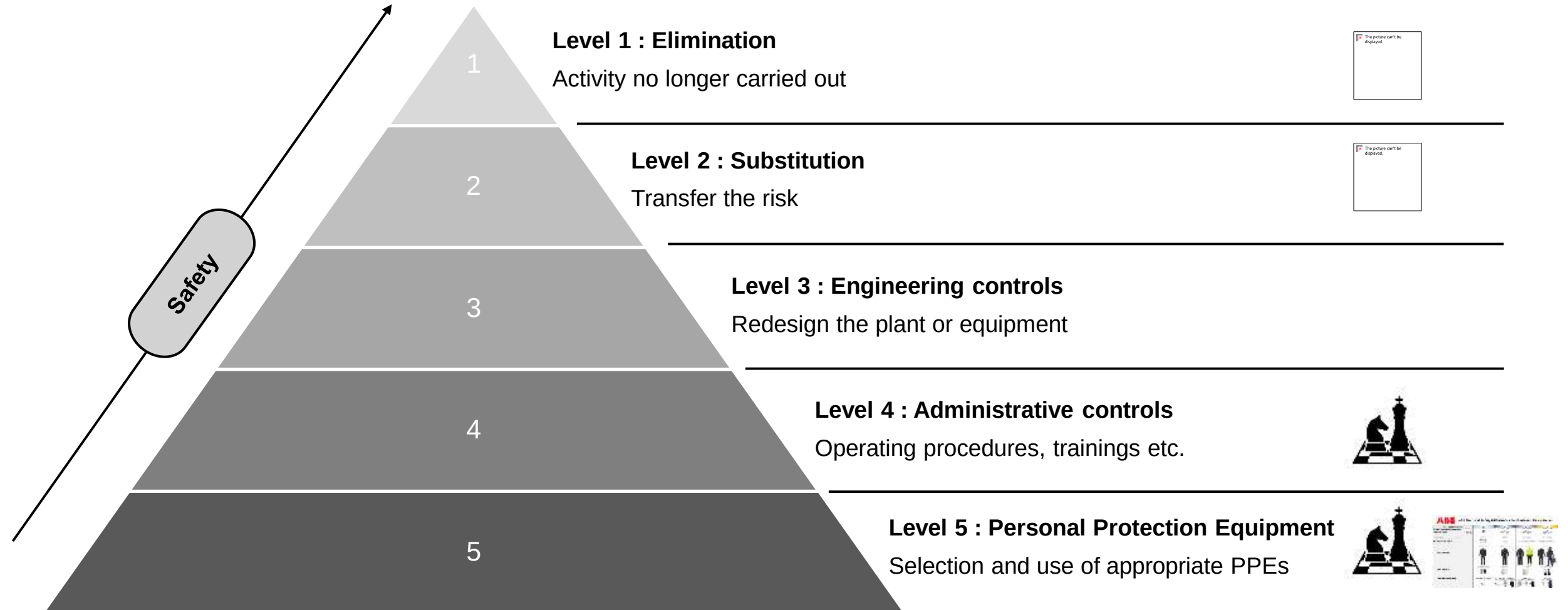


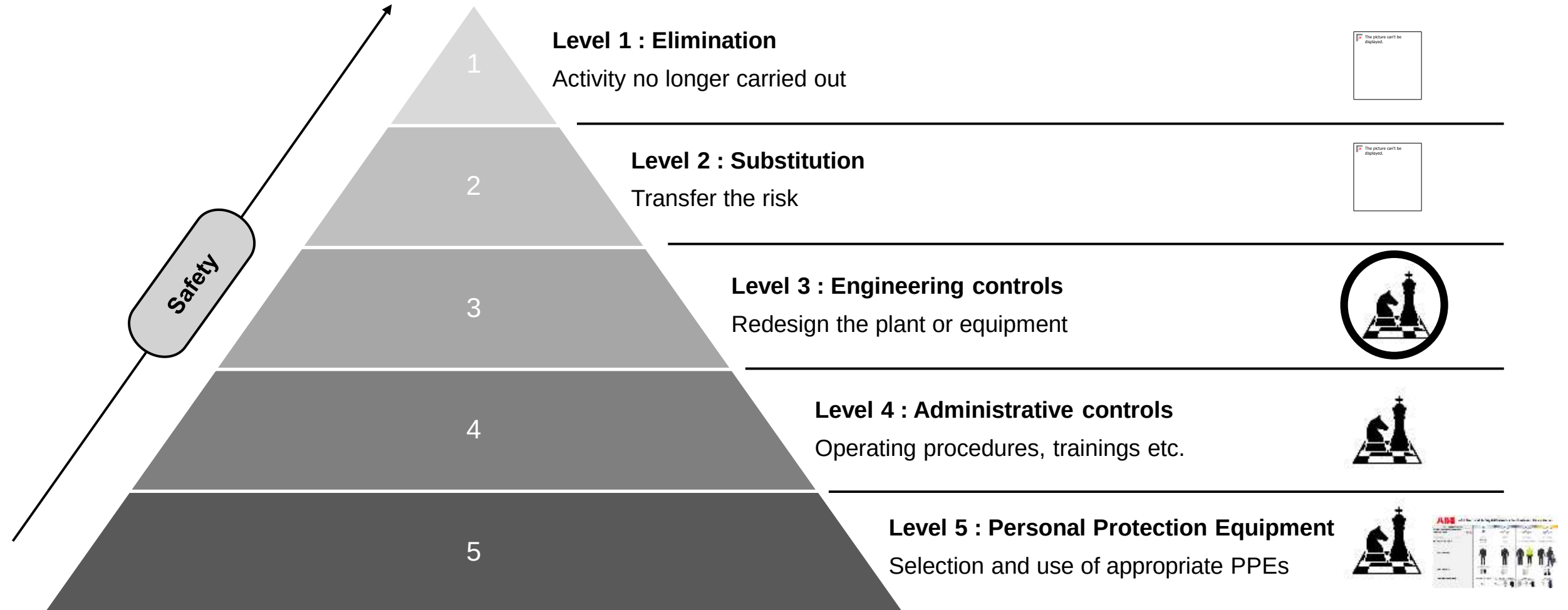


ABB Electrical Safety PPE Matrix - Arc Flash And Shock Hazard

Arc Flash Protection	A	B	C	D
Upstream Overcurrent Protective Device	≤16A	>16A ... ≤160A	>160A ... ≤630A	>630A ... ≤3.2kA
Short Circuit Current	and ≤1 kA	or >1kA ... ≤10kA	or >10kA ... ≤25kA	or >25kA ... ≤65kA
Energy Storage (e.g. Capacitors $W=1/2 \cdot C \cdot U^2$)	and Un≤600V Un>600V	and >1kA ... ≤5kA	and >5kA ... ≤12kA	and >12kA ... ≤22kA
Energy Storage (e.g. Capacitors $W=1/2 \cdot C \cdot U^2$)	≤10 kJ	≤10 kJ	>10 ... ≤150 kJ	>150 ... ≤300 kJ
Arc-rated workwear Properties of the protective garments worn as: NFPA 70E® / IEC 61482-1-2	ABB's minimum arc flash workwear ATPV ≥8 Cal/cm ² Class 1 (IEC) Category 2 (NFPA 70E)	One layer ATPV ≥8 Cal/cm ² Class 1 (IEC) Category 2 (NFPA 70E)	Multi-layer Recommended (*NB7) ATPV ≥25 Cal/cm ² and ATPV ≥8 Cal/cm ²	Multi-layer Recommended (*NB7) ATPV ≥40 Cal/cm ² Full Suite and ATPV ≥8 Cal/cm ²
Body protection				
Hand protection	CAT 2 Arc Grip Glove (*TN2) 	CAT 2 Leather 	CAT 3 Leather 	Arc Rated CAT 4 ≥40 Cal/cm ² 
Face and Ear protection	Safety Glasses - Non-Conductive 	≤240V Safety Glasses - Non-Conductive >240V CAT 2 Face Shield + CAT 2 Balaclava 	CAT 3 Face Shield + CAT 3 Balaclava + Ear Protection 	Ear Protection + CAT 4 Complete Hood 

Hazard mitigation strategies

Hierarchy of controls

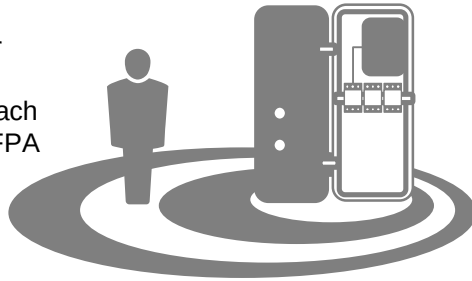


CB racking

High risk of arc flash

Manual racking

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V/s

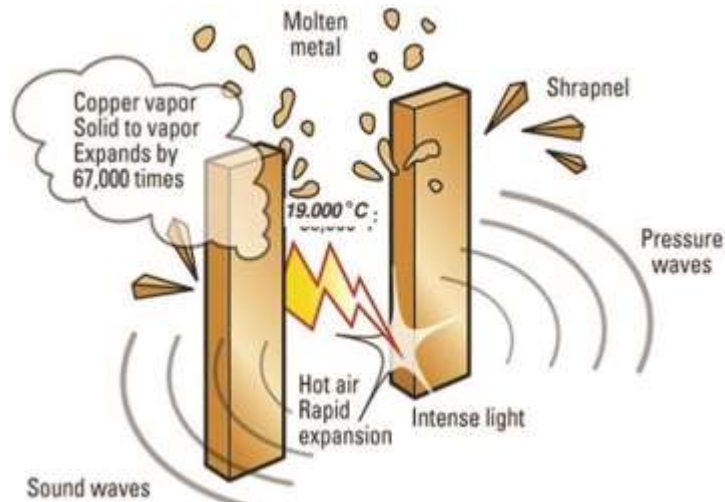
Remote racking

Up to 30 Feet



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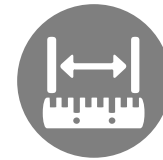
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Keep your personnel out of the arc flash zone

Introducing the future

Wireless motorized racking



Complete Remote Operation

Racking breakers from a safe distance up to 30 feet using a wireless controller, keeping operators out of hazardous zones entirely.



Automated Precision

Motorized system ensures consistent, accurate racking every time, reducing equipment wear and eliminating human error in alignment.



Enhanced Safety

Completely eliminates operator exposure to arc flash hazards and physical strain injuries, creating a safer work environment.



Increased Efficiency

Faster and more reliable racking process, minimizing downtime and improving operational readiness.

Wireless motorized racking

The components



Motor truck - The racking mechanism with motor mounted on CB



Receiver Unit - Mounted in LV box of the panel



Transmitter Unit - Handheld remote

Wireless motorized racking

Features and benefits



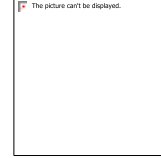
Versatile Application

Ideal for new installations and retrofitting existing switchgear, including challenging environments like confined spaces and contaminated areas.



Control at your fingertips

Control up to 63 circuit breakers with single transmitter supporting ON/OFF commands and racking functions with real time status feedback.



Easygoing power source

Rechargeable battery for transmitter gives you peace of mind from battery replacement. Battery level indicator on transmitter alerts you when battery is to be charged?



Cost effective solution

No need of expensive SCADA system to do operations remotely. Fast implementation without need of control cable laying.



The smart choice for modern electrical infrastructure

Values



Protect Your People

Invest in solutions that safeguard your most valuable assets – your workforce



Embrace Innovation

Upgrade to wireless motorized racking for superior safety and efficiency

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Optimize Operations

Achieve greater reliability and reduce operational costs



Extend equipment life

Minimize wear on racking mechanism, interlock and CB components with controlled force



A photograph of a classroom or meeting room. In the foreground, a person's hand is raised high, wearing a red knitted sleeve. The background is blurred, showing other people and a person standing near a whiteboard. The text "Questions and answers" is overlaid in large black font, preceded by a red horizontal line.

Questions and answers

