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# Siemens GBS Portfolio

## Medium Voltage & Systems

# A Tale of Two Technologies For MV Generator Breaker Switchgear

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SF6

Vacuum

# Vacuum Technology – Success Story

## Overview of the global market share of MV Circuit Breakers

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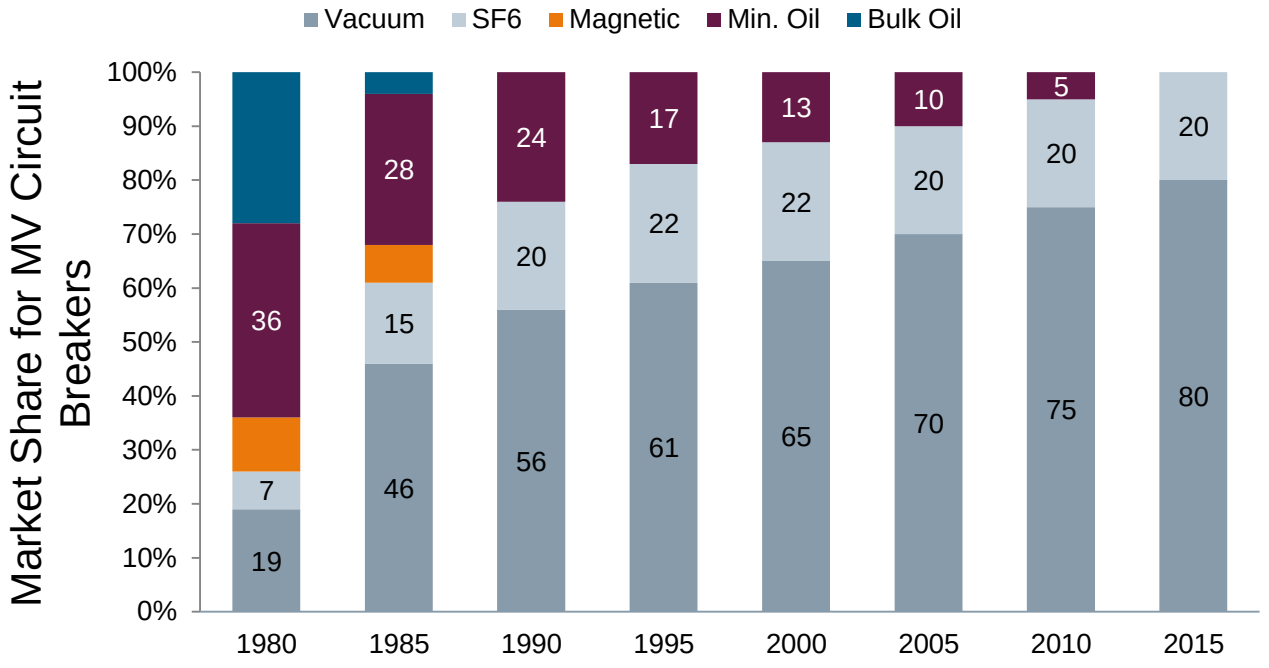
### Market Penetration of vacuum breakers for MV

- In 1980 – 20%
- Nowadays – around 80%

### Reasons for success

- High number of operation cycles
- Preservation of the quality of the vacuum throughout the entire life time
- No monitoring system required
- Maintenance-free
- Environmentally friendly
- Compact construction



# Advantages of Vacuum Interruption over Gas

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**Vacuum Interrupters are sealed for life**

- **Breaking capability *not affected by pressure and temperature of gas***
- No maintenance and monitoring of contact system
- No capacitor required for High short circuit applications
- No low ambient temperature concerns

**Spring-Spring Drive Mechanism**

- **Opening time and speed are not affected by pressure and temperature of hydraulic oil**
- No blocking of trip on low gas/hydraulic pressure

**Number of Operations:**

- 10,000 operation electrical and mechanical cycles at rated current
- **30 interruptions at 100% of short circuit current**
- 300 interruptions at 10-100% of short circuit current

# Siemens Technology
## Comparison of Lifecycle Costs

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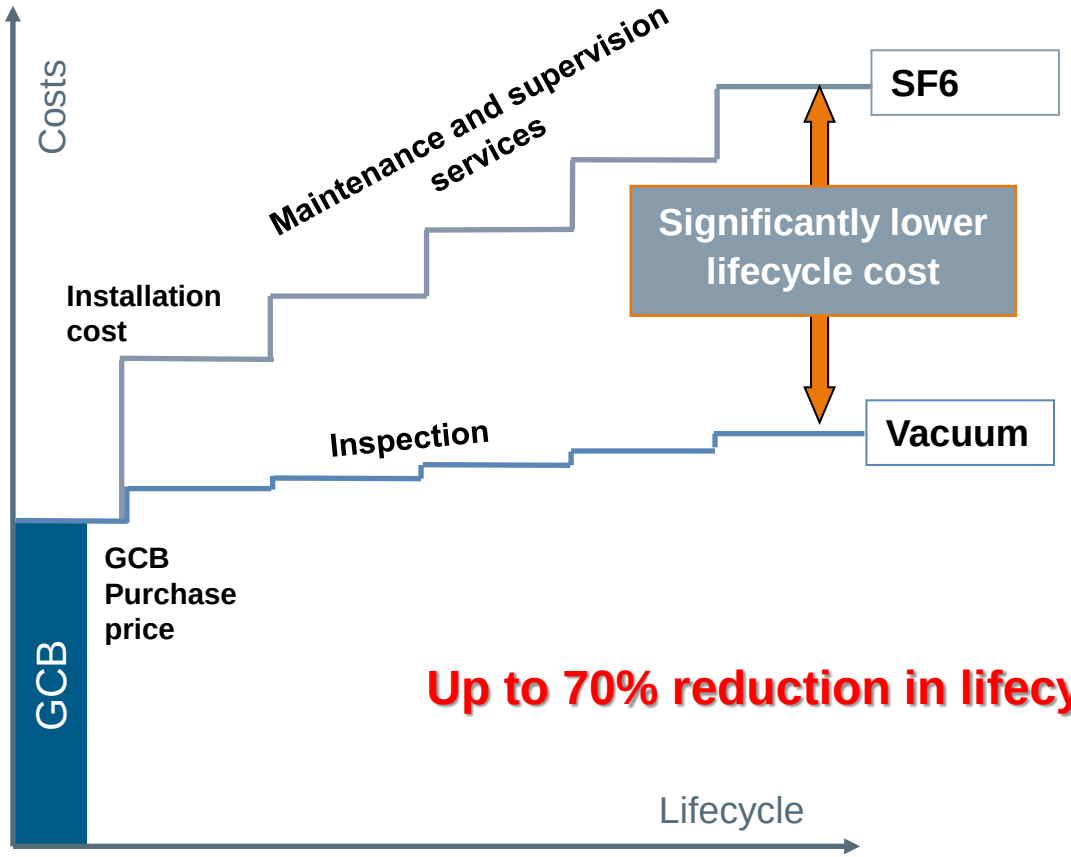
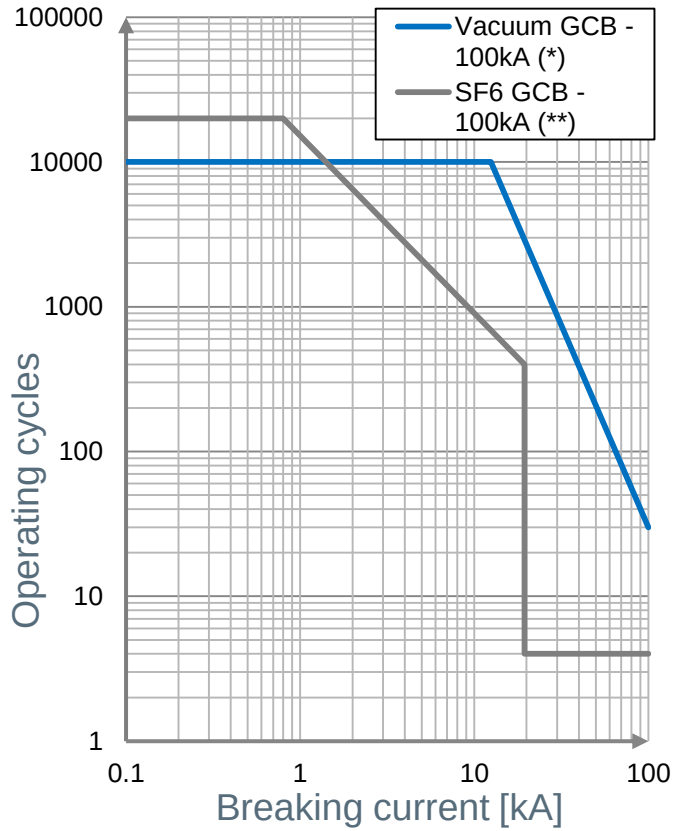
### Minimum operational and maintenance costs




**Up to 70% reduction in lifecycle costs**

### Higher number of switching operations




(*) SF6 GCB according to manual
HECS – 100L document no. 1HC0066312 AC D01

(**) Vacuum GCB according to HB3 100 manual

# Generator Circuit-Breaker Switchgear Portfolio

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**HB3 - Horizontal Busbar**

Removable type
up to 400 MW
up to 24 kV
up to 12,500 A
up to 100 kA, 3 s

**HB1 - Horizontal Busbar**

Removable type
up to 170 MW
up to 24 kV
up to 6,700 A
up to 72 kA, 1 s

**VB1 – Vertical busbar**

Removable type
up to 140 MW
up to 24 kV
up to 5,500 A
up to 72 kA, 1 s

**VB1-D – Vertical busbar, Drawable**

Withdrawable type
up to 110 MW
up to 17.5 kV
up to 5,100 A
up to 63 kA, 3 s

**GM-SG**

Withdrawable type, ANSI
up to 80 MW
up to 15 kV
up to 4,000 A
up to 63 kA, 3 s

**NXAIR**

Withdrawable type, IEC
up to 50 MW
up to 17.5 kV
up to 4,000 A
up to 50 kA, 3 s

# Generator Circuit-Breaker Switchgear GM-SG – Technical Data

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## Application:

Practical range 10 - 80 MW Generators

## Ratings:

- $U_r$:15 kV
- $I_r$:up to 3,000 A  (4,000 A - forced cooling)
- $I_{sc}$ (3 s):up to 63 k A

## Breaker types:

- Type tested to IEEE C37.013a
- Arc Resistant - Type 2B

## Dimensions:

- 914 x 2,507 x 2,419 mm (W x D x H)

## Installation

- Indoor or outdoor application

## Connection methods

- Cable
- Bus ducts

## Degree of protection

NEMA1 / NEMA3R

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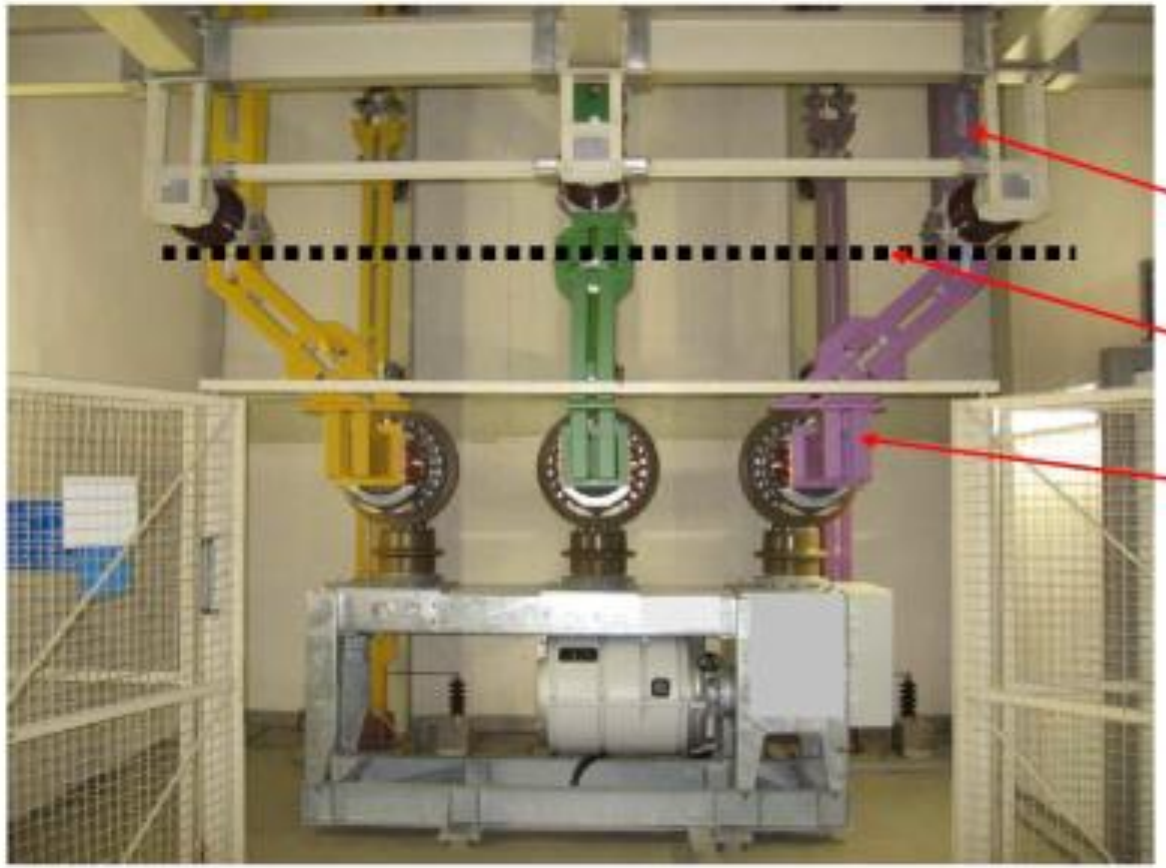
# Retrofit Solutions

## Medium Voltage & Systems

# Replacing Existing Gas GCBs with Vacuum GCB



**Frontview of the existing SF6-generator breaker**
**( 24kV – 8500A – 100kA )**

**Existing set-up since year 2000**

Main leads coming up downstairs from generator

Cut-line of the connections to implement the first approach with 3AH38 breakers

Main leads going upstairs to phase reveral disconnectors and step-up transformer

**Connection terminal**

Existing flex-connection straps shall be re-used.
Re-use of the existing.
Details: 12 straps CU,
each 48 x 80mm, thickness 15mm

# Replacing Existing Gas GCBs with Vacuum GCB

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Main leads towards generator

Main leads towards step-up transformer

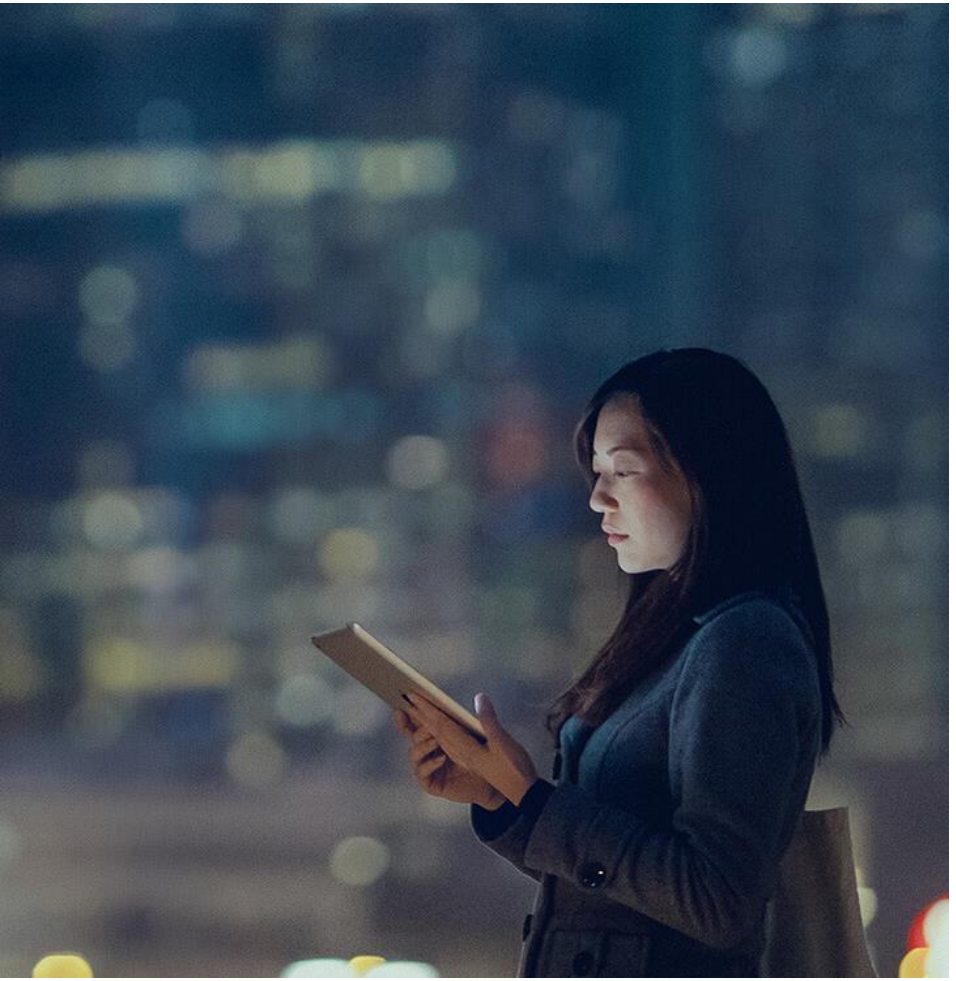
Only horizontal bus had to be shortened by approx. 400mm

**Pictures of 3AH36-generator breaker module for first group in PSP Markersbach.**

( The disconnector function is disabled for this application as there are separate disconnectors at the floor level above )

**Siemens AG, EM MS PLM GBS ( Oct. 2017 )**
**Generator Breaker Systems / Retrofit Solutions**

# Contact Information



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