

GIS CIRCUIT BREAKER RETROFIT

Extend the Lifetime of your Substations

One of the major challenges of aging Gas-Insulated Substations (GIS) is optimizing the cost of asset ownership as maintenance needs increase and specific technology becomes obsolete. GIS circuit breakers with hydraulic or pneumatic mechanism are exposed to the highest risk of major failure with 32% of major failures linked to a component within the circuit breaker operating mechanism. Operators need solutions that extend the lifetime of the substation while improving asset reliability.

GE Vernova Solution

GE Vernova's GIS retrofit solutions are designed to replace aging or obsolete circuit breakers manufactured by GE Vernova or a third party with a new GE Vernova circuit breaker with pure spring mechanism.

GE Vernova's solutions are a cost-effective and reliable method to modernize and extend the lifetime of the substation by gaining all the advantages of implementing new, reliable technology.

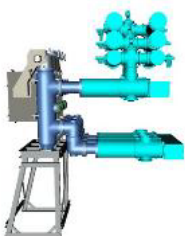
The turnkey service solution includes:

- Pre-study to select the correct technical solution for the application
- Adaptation design
- Supply of new components including interface and GE Vernova vertical circuit breaker with pure spring mechanism
- Installation, testing, and commissioning of the new assets within the substation.

Applications

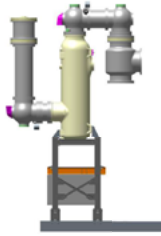
The GE Vernova solution is designed for gas-insulated substations, regardless of the manufacturer or the application and suitable to replace vertical or horizontal GIS circuit breakers. To match the existing configuration and dimensions, phase-distance can be adapted with the interface.

For 72.5 to 145 kV GIS

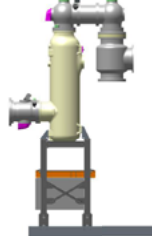


U configuration

For 245 kV to 420 kV GIS



U configuration



Z configuration



Versatile Solution

- Suitable for all brands of GIS
- Different configurations available to fit with existing architecture
- Compact footprint with vertical arrangement

Reliable Technology

- Up to 42% reduction in unplanned outage risk, due to pure spring operating mechanism
- Up to 22% reduction in outage duration due to "plug and play" solution

Safe and Ecofriendly

- 50% reduction in SF₆ mass
- 10x Reduction in Leakage Risk
- 25% reduction in required material including copper, aluminum and gaskets

Cost-Effective Solution

- Up to 60% reduction in maintenance costs due to pure spring mechanism compared to pneumatic or hydraulic technology
- Reduced investment costs and outage times compared to a GIS replacement

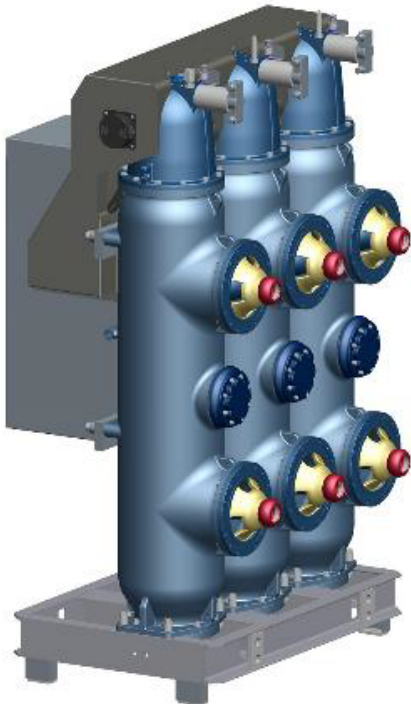


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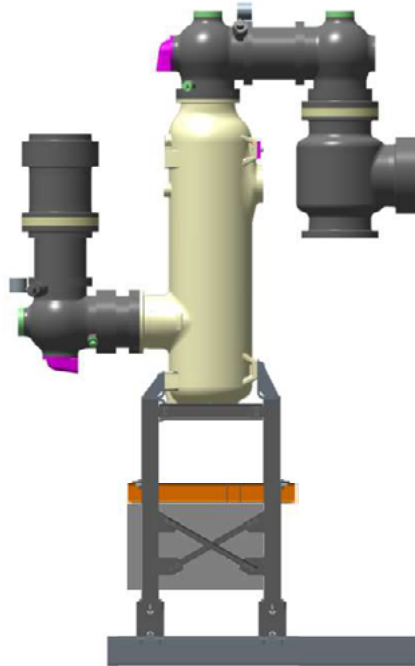
Technical Advantages of Circuit Breakers with Pure Spring Mechanism

The vertical circuit breakers proposed to retrofit the gas-insulated substation are equipped with the pure spring mechanism used in all GE Vernova circuit breakers. This proven technology enables minimized maintenance and improved reliability. Key features include:

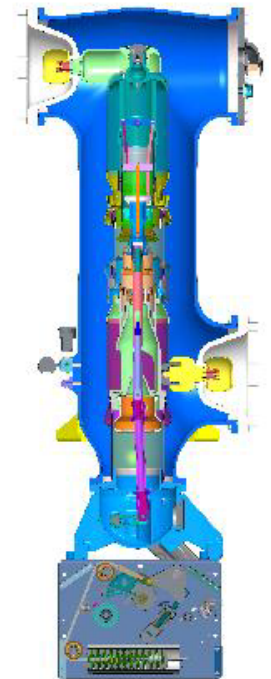
- Single-phase enclosure ensures safe operation with all moving parts fully encapsulated
- Gas compartment is up to 50% smaller compared to the previous generation
- Low closing and tripping force is required reducing the need for energy to trigger the switching
- Low static and dynamic forces reduce the mechanical constraints and stress during operation, resulting in increased asset reliability
- Single chamber design lowers the number of moving parts and the energy required
- All models are type tested
- A CSD100 point-of-wave controller can be added to the solution to synchronize the phases for switching



*Circuit Breaker up to 145 kV
3-Pole Operated*



*Circuit Breaker up to 245 kV
1-Pole Operated*



*Circuit Breaker up to 420 kV
1-Pole Operated*

Main Technical Characteristics

BREAKER TYPE	145 kV VERTICAL	245 kV VERTICAL	420 kV VERTICAL
Reference electro-technical standards	IEC / IEEE	IEC / IEEE	
Rated voltage	145 kV	245 kV	420 kV
Rated frequency	50 / 60 Hz		
Enclosure	Single-Phase		
Short-duration power-frequency, phase-to-earth / across isolation distance	275 / 315 kV	460 / 530 kV	520 / 610 kV
Lightning impulse phase-to-earth / across isolation distance	650 / 750 kVp	1050 / 1200 kVp	1425 / 1425 (+240) kVp
Rated current	up to 3150 A	Up to 4000 A	up to 5000 A
Rated peak withstand current	100 / 108 kAp	170 kAp	170 kAp
Rated short-time current (3 s)	40 kA	63 kA	63 kA
Rated short circuit breaking current	40 kA	63 kA	63 kA
First-pole-to-clear factor	1.5	1.3 - 1.5	1.3-1.5
Operating sequence	O - 0.3s - CO - 3 min - CO / CO - 15s - CO		
Min. gas operating pressure at 20°C (50 Hz)	5.5 bar rel.	6.1 bar rel.	5.5 bar rel.
Circuit breaker approx. weight*	1500 kg	1980 kg	4230 kg

* For three poles.

Other data available upon request.

Gas Data*

The functioning of this equipment relies on SF₆, a fluorinated greenhouse gas.

SF ₆	145 kV VERTICAL	245 kV VERTICAL	420 kV VERTICAL
Average mass of gas/mixture per pole*	5.4 kg	13.6 kg	50/60 kg
GWP100 of gas/mixture (CO ₂ -equivalent)	24,300	24,300	24,300
CO ₂ -eq of gas/mixture in the equipment*	131.2 t _{co2-eq}	330.5 t _{co2-eq}	1215/1458 t _{co2-eq}

*For information purposes only. It varies depending on the equipment considered.

Contact us: <https://pages.gegridsolutions.com/ALM-Services.html>

For more information, visit
governova.com/grid-solutions

Major Failure Risk Data Source: CIGRE 2012-A3.06: Reliability analysis of CB

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