

### **RELIABLE POWER DISTRIBUTION**

## **Outdoor systems** for a more resilient grid

Start



### Introduction

Power distribution grids are becoming more and more complex. To facilitate a reliable power supply, increased resilience is needed. Therefore, we focus on helping customers to improve the reliability and efficiency of their distribution grids. From the substation to the end users, we offer a complete portfolio for energy distribution over the entire supply chain: from planning through design and manufacturing up to installation, operation and service. By keeping them a step ahead of their challenges from end to end, utilities are enabled to optimize less developed network environments towards a future-oriented smarter grid.

Our benchmark in terms of sustainability and safety are an important foundation for all outdoor distribution projects. The entire portfolio of circuit breakers and reclosing devices is based on vacuum switching technology, offering flexibility in application, as well as extreme resilience and durability. With reduced maintenance, this technology also ensures improved operator safety. Control and monitoring functions for smart grid application support asset performance and allow to make the most of your installation.



### **Outdoor systems for distribution networks –** from the substation to the end users



Introduction Outdoor systems Sustainability

Resilience Health

Smart grid

**SUSTAINABILITY** 

### We contribute to decarbonization

Our portfolio supports the integration of sustainable power generation into existing grids, and promotes future topics such as electromobility by increasing grid reliability. As a pioneer in vacuum switching technology, we drive the transformation towards equipment with a low environmental impact to further reduce emissions. Our outdoor switching devices are a successful example for state-of-the-art technology focused on sustainability over the entire product lifecycle.





We combine the latest technology in vacuum switching and electronic control as an alternative to assets using oil or SF<sub>6</sub>.



The use of selected high-quality materials (including reusables and recyclables) minimizes environmental impacts and enables an extended product life.



Remotely controlled assets reduce the need for truck rolls and personnel on site.



The integration of renewable energies is supported by an enhanced portfolio, designed to a better infeed from distributed power generation for a more reliable grid.



With pioneering innovations, we can provide advanced protection to minimize the risk of wildfires caused by electrical faults.

### RESILIENCE

### **Outstanding capacity** to adapt to critical situations

Overhead lines constitute about 70 percent of the world's medium-voltage power distribution grids. They extend many thousands of miles, often in sparsely populated areas. Impacts from external influences such as extreme weather events, lightning strikes, falling branches, or animals make them vulnerable to faults. To withstand adverse conditions and minimize faults and outages in networks, a greater resilience is required. With leading technology, high standards in quality, and ongoing development, we can provide an exceptional product portfolio to improve network performance.





Less and shorter periods of blackout: self-healing ability to recover fast by isolating a fault



Designed and tested for applications in harshest environments



Self-powered assets: with the ability to be powered either by low line current or voltage, the switching devices are particularly suitable to face challenges in rural areas



Ultra-fast fault clearing: unsurpassed clearing time helps to virtually eliminate the impacts of transient and permanent faults on lateral lines

Resilience

Health and safety

**Cost-efficiency** 

Smart grid

### **HEALTH AND SAFETY**

### No compromise on health and safety

VEMENS

Driven by innovation, our engineers aim to develop safer switching solutions and improved design concepts. From conception to product development, the ease of installation and operation, reduced maintenance, and outstanding protection are at the core of our efforts. The result is a portfolio that encompasses products with a small footprint, less weight, fully integrated technology, simplified installation, and fast commissioning. These factors contribute to less operator risks and improved safety. Additionally, end users are less impacted by system downtime or maintenance work.





High operational safety (e.g. arc-resistant design where applicable, restrike-free equipment, mechanical and electrical interlocking)



Reduction of the risk of injury: smart product design with integrated technology, combined with a small footprint and less weight, improve the overall installation process while reducing injury hazards significantly



Less contact with assets in service: a low-maintenance approach as well as product monitoring features reduce the direct contact with a product in service to a minimum



Ultra-fast fault clearing: Reducing the number and duration of power outages minimizes interruptions and limits dangers and inconveniences

Resilience

Health and safety

**Cost-efficiency** 

Smart grid

**COST-EFFICIENCY** 

# Make the most of your budget

With a cost-efficient approach, customers achieve optimal results for their assets. This includes a lower investment cost, the avoidance of penalties (SAIDI and SAIFI), quicker installation and commissioning of equipment, and less truck rolls due to better network protection. Combined with low-maintenance requirements, this results in low operating costs and a fast return on investment (CAPEX and OPEX savings).



Functional and solid product development helps to optimize applications and simplify installations



Less truck rolls and lower labor cost result in reduced operational cost



Further cost reduction is achieved thanks to low capital and maintenance cost



Less outages lead to decreased penalty payments and a higher end-user satisfaction

Resilience

Health and safety

**Cost-efficiency** 

Smart grid

**SMART GRIDS** 

### **Clever functions** for reliable operation

To meet varying electricity demands, our advanced solutions enable to sense, monitor, communicate, and manage energy flows, as well as real-time electricity asset management. Smart grids are designed to maintain system resiliency, stability, and reliability while allowing maximum renewable power generation connected to the grid at the same time. Flexible solutions for automatic protection and remote operation, supported by state-of-the-art communications for lightning-fast data exchange is the key to achieve this. We meet the demanding requirements of smart grids, from simple standard to highly sophisticated protection functions, for maximum selectivity up to monitoring, remote control, and advanced self-healing for overhead-line networks.





Advanced capabilities for reliable and flexible communication

↓↓↓

Extensive protection, metering, and monitoring functions including loop automation



Smart grid-ready devices enable renewable power generation and improve grid resilience



Join the digital transformation to boost efficiency and create new opportunities in a changing ecosystem

**Cost-efficiency** 

Smart grid



**OUTDOOR MEDIUM-VOLTAGE DISTRIBUTION EQUIPMENT** 

# **For improved reliability and safety** in distribution grids



Sustainability Introduction Outdoor systems

Smart Distribution Recloser (SDR)	Compact Modular Recloser (CMR)	<b>Fusesaver</b> ® circuit breaker
up to 38 kV 12.5 to 16 kA 200 to 800 A	up to 27 kV (three-phase) or 38 kV (single-phase) 6.3 to 12.5 kA 630 to 800 A	up to 27 kV 1.5 to 6.3 kA 40 to 200 A
Learn more	Learn more	Learn more

Resilience

Health and safety

**Cost-efficiency** 

Smart grid

### **SUBSTATION**

### **Dead-tank** circuit breaker (SDV-7 and SDV-R)

After introduction, the SDV product line has been operating reliably in distribution grids for 40 years, and it is available in arc-resistant and non-arc-resistant designs. By removing grounding transformers while adding a fast-acting grounding capability, the SDV-R<sup>™</sup> offers wind power producers a welcome alternative that not only reduces the total installed cost and physical footprint, but also eliminates the risk of transformer oil spills.

- Stored-energy (spring) and magneticactuated operating mechanisms for conventional and arc-resistant enclosures
- Enclosure construction tested for internal arcing in accordance with IEEE C37.20.7, for accessibility type 2B
- Fast-acting grounding switch for renewable applications



#### Learn more

### **Technical data**

Number of phases	3-phase	3-phase	3-phase
Rated voltage U <sub>r</sub>	15.5, 17.5 kV	27.6 kV	38 kV
Rated normal current I <sub>r</sub>	1,200 to 3,000 A	1,200 to 2,000 A	1,200 to 2,500 A
Rated short-circuit breaking current I <sub>sc</sub>	20 to 40 kA	20 to 25 kA	20 to 40 kA
Number of operating cycles without maintenance	10,000	10,000	10,000

### Asset performance

- Arc-resistant circuit-breaker with fast-acting grounding capability simplifies the installation and operation of the system and protection coordination
- Highly reliable vacuum interrupters with Mean-Time-to-Failure (MTTF) of more than 53,000 years
- Contact configuration designed for minimized contact erosion, providing up to 100 full-rated fault interruptions (depending on rating) before replacement
- Moderate and high seismic qualification (Zones 1 4) available





# **B-2 regulator/recloser** bypass

The medium-voltage overhead bypass assemblies enable the easy and rapid bypassing of damaged/ faulty equipment to restore power and to carry out maintenance without an outage and maximum power availability.

Siemens type B-2 bypass assembly offers quick and simple installation. Originating from the reliable B-2 single-phase switch, all three-phase units ship preassembled on the crossarm for easy installation at the site, which reduces time and overall installation costs. A B-2 bypass assembly is customizable with porcelain or polymer insulators and galvanized or fiberglass bases.

- Adjustable pole gain provides angling option per field conditions
- Easy identification of bypass blades in open or closed position
- Custom configurations available
- Coastal environment options



Learn more

### **Technical data**

Number of phases	1, 2, and 3-phase
Rated voltage U <sub>r</sub>	15, 25/27, and 38 kV
Rated normal current I <sub>r</sub>	600 and 900 A
Rated lightning impulse-withstand voltage (BIL)	110, 150, and 200 kV

### **Asset performance**

- Rapidly restore power in the event of an equipment failure
- Reduce downtime when maintenance is required
- Easily ensures service continuity while doing maintenance or service work on the recloser
- Minimize installation time through pre-assembly



### **Disconnect switch**

The comprehensive product portfolio, from station class and distribution class disconnect switches to bypass and group-operated disconnect switches, ensures safe network operation.

- Designed for a wide variety of applications and climatic conditions
- Plug-in Saf-T-Gap interrupter changes in seconds with a standard shotgun-style hookstick
- Disconnect and bypass switches feature rugged square tubular copper blade
- Quick break and closer arm options

Learn more



### **Technical data**

Number of phases	1, 2, and 3-phase
Rated voltage U <sub>r</sub>	15, 25/27, and 38 kV
Rated normal current I <sub>r</sub>	600, 900, 1,200, and 2,000 A
Rated lightning impulse-withstand voltage (BIL)	110, 150, and 200 kV

### **Asset performance**

- Integration into SCADA with motorized group-operated disconnect switches
- Highly proved for safe operation



## **Smart Distribution Recloser** (SDR)

The SDR is a modular switching device adapted to harsh climatic conditions for a wide range of applications especially in microgrids and smart grids – starting with basic protection and monitoring functions up to cutting-edge technology with advanced capabilities for fast fault isolation and network digitalization.

- Flexible recloser system for installation in substations, pole-mounted, or pad-mounted
- Four trips to lock out per IEEE 37.60 in case of a temporary line fault, thus avoiding longer network interruptions
- Ready for use in meshed grids with automatic source transfer within six cycles, and fault isolation possible under 500 ms for use in self-healing applications
- Control panel options available, either Siemens type 7SC80 or Schweitzer Engineering Laboratories, Inc. types SEL-651 or SEL-351



#### Learn more

### **Technical data**

Number of phases	1, 3-phase, and triple-single
Rated voltage U <sub>r</sub>	12, 15.5, 27, and 38 kV
Rated normal current I <sub>r</sub>	200, 400, 630, and 800 A
Rated short-circuit breaking current I <sub>sc</sub>	12.5 and 16 kA
Number of operating cycles without maintenance	30,000

### **Asset performance**

- Just two designs cover the whole range (up to 27 kV and up to 38 kV)
- Long lifetime including preventive maintenance features like I<sup>2</sup>t-calculation for VI-lifetime, internal battery, and capacitor supervision
- Several diagnostic functions with watchdog alarm to mobile phones and SCADA systems
- High-accuracy (1%) resistive voltage sensors
- More than 30,000 operating cycles
- Fast fault isolation < 500 ms possible
- 25 years maintenance-free service life (excluding batteries)



### **Compact Modular Recloser** (CMR)

The CMR approaches overhead distribution protection in a new way. Self-powered by the line voltage, the recloser provides fundamental protection and monitoring capabilities for single and multi-phase applications in the most cost-efficient way.

- Self-powered by line voltage
- Compact and lightweight (< 50 lbs)
- Optically ganged multi-phase operations
- Fully insulated design
- Vacuum-interrupting alternative to traditional single-phase hydraulic reclosers



Learn more

### **Technical data**

Number of phases	1, 2, and 3-phase	1-phase only
Rated voltage U <sub>r</sub>	up to 27 kV	up to 38 kV
Rated normal current I <sub>r</sub>	630 A (at 55 °C) 800 A (at 40 °C)	630 A (at 55 °C) 800 A (at 40 °C)
Rated short-circuit breaking current I <sub>sc</sub>	12.5 kA	6.3 kA
Number of operations at rated current	10,000	10,000

### **Asset performance**

- Self-powered by line voltage, no auxiliary power supply required
- Rechargeable battery for back-up power
- Self-contained (all-in-one) compact recloser, including switching unit and electronics/ configuration/communication in single tank
- Integration into SCADA via optional Remote Control Unit (RCU)
- Integrated GPS time synchronization
- Wireless connectivity
- Configurable protection
- 25 years maintenance-free service life (excluding batteries)



### **OVERHEAD LINES**

### **Fusesaver**<sup>®</sup> circuit breaker

By virtually eliminating the impacts of faults on lateral lines, Fusesaver helps utilities to increase network reliability while minimizing operating costs of overhead medium-voltage networks in rural areas.

- The world's fastest circuit-breaker (half-cycle switching)
- Small and lightweight (12 lbs)
- Highly versatile with multiple functions (fuse saving, reclosing, sectionalizing, switching)
- Self-powered by low line current (as little as 0.15 A)
- Wireless multi-phase operation
- Our encapsulated vacuum interrupter switching is an alternative to fuses and supports wildfire mitigation



Learn more

### **Technical data**

Number of phases	1, 2, and 3-phase
Rated voltage U <sub>r</sub>	15 and 27 kV
Rated nominal continuous current	40, 100, and 200 A
Rated short-circuit breaking current I <sub>sc</sub>	1.5, 4, and 6.3 kA
Number of operating cycles without maintenance	2,000

### **Asset performance**

- Self-powered by low line current, no auxiliary power supply required
- Rechargeable battery for back-up power
- Wireless connectivity
- Integration into SCADA via optional Remote Control Unit (RCU)
- Wirelessly ganged three-phase switching
- Synchronized three-phase switching
- Configurable protection
- 25 years maintenance-free service life (excluding batteries, which are 10 years)



Smart Infrastructure intelligently connects energy systems, buildings and industries, enhancing the way we live and work to significantly improve efficiency and sustainability.

We work together with customers and partners to create an ecosystem that both intuitively responds to the needs of people and helps customers achieve their business goals.

It helps our customers to thrive, communities to progress, and supports sustainable development to protect our planet for the next generation.

Creating environments that care.

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