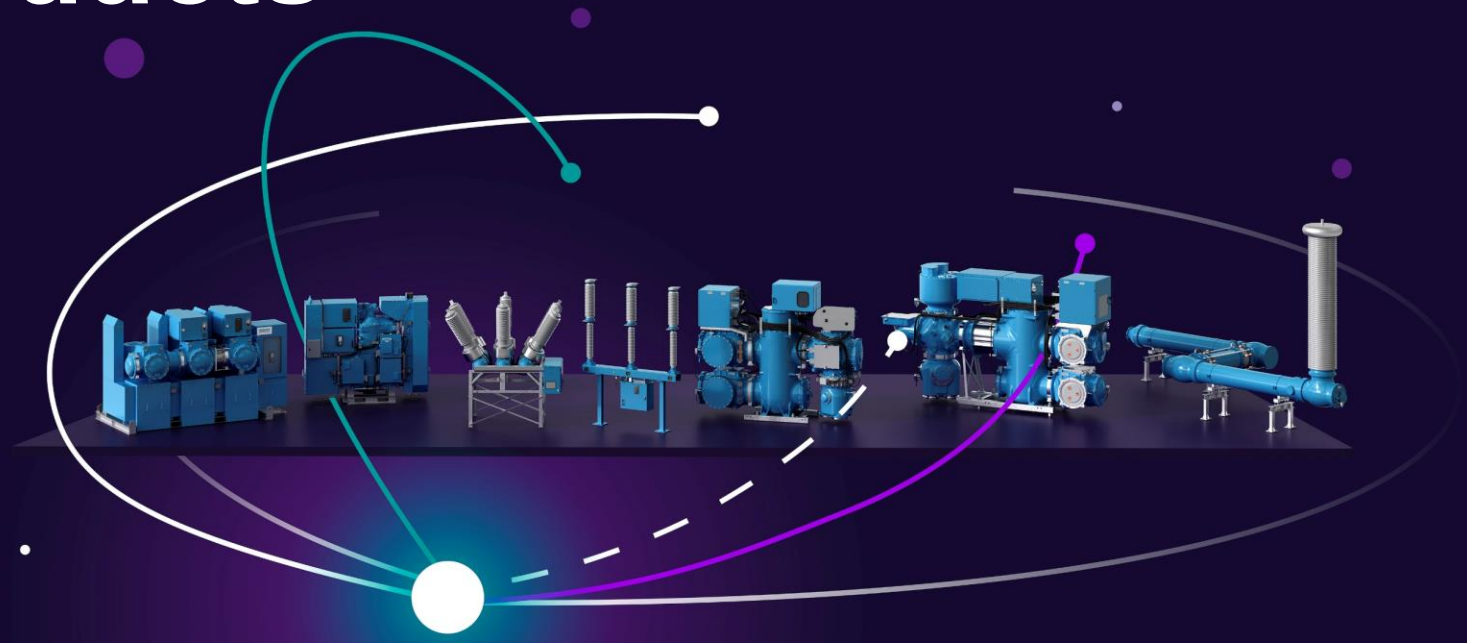
Siemens Energy Blue high-voltage products

Sustainable Zero-impact switchgear for a net Zero future



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1. The growing market demand for F-gas-free high-voltage switchgear

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There is an increasingly urgent need to achieve decarbonization in all sectors worldwide – actions to reduce GHG emissions must be taken fast

- In the UNFCCC (United Nations Framework Convention on Climate Change) Paris Agreement signed by 189 countries in 2015, it was agreed to limit anthropogenic global warming to well under 2º centigrade
- Each country must determine and report regularly on how it intends to mitigate its greenhouse gas emissions and thus reduce global warming
- Up to now more than 100 countries have submitted a net-zero document (Net-Zero Tracker)

US
2035: 100% clean electricity
2050: Net zero GHG pollution

EU
2050: First climate-neutral continent

China
> 2030: CO_2 emission peak
> 2060: Carbon neutrality





The pressure on power companies to phase out SF_6 and other F-gases is especially high

- With global carbon emissions hitting an all-time high of 47.5 Gt in 2020*, there is growing pressure on power companies to step up their decarbonization efforts
- SF_6 is classified as a strong greenhouse gas (GHG) with a CO_2 equivalent of 24,300, but is still commonly used as an isolation gas in switchgear products
- An increasing number of companies have already committed to switching to SF_6-free alternatives





* Climatewatchdata.org

SF_6 gas has a GWP 24,300 times higher than CO_2 – and the GWP of other F-gas alternatives is also way above zero

What is global warming potential (GWP)?

It represents the heat absorption effect of any GHG relative to CO_2, which has a GWP of 1

SF_6 installations
10,000 tons of SF_6 are installed annually, with leakage[1] of 50 tons and a GWP of around 24,300[2]

It takes **1,000 years** for nature to absorb SF_6

19,440,000,000 trees are needed to absorb the impact of the yearly installations and **89,424,000** to absorb the yearly leakage of SF_6

Fluoronitrile-mix[3]
10,000 tons of Fluoronitrile-mix are installed annually, with leakage[4] of 50 tons and a GWP of around 500

It takes **30 years** for nature to absorb Fluoronitrile-mix

321,600,000 trees are needed to absorb the impact of the yearly installation and leakage

Vacuum and clean air
This is the most environmentally friendly switching technology in the world with a GWP of 0

The leakage rate of clean air is **0.1%** and it is naturally absorbed by the surrounding air

0 trees needed
No greenhouse gases
No impact on health or environment

At the moment, **natural-origin gases** like **clean air** are the **only way to achieve Zero.**

[1]Leakage rate of SF_6 is typically 0.5%. Source MDPI: Evaluation of SF_6 Leakage from Gas Insulated Equipment on Electricity Networks in Great Britain, August 2018
[2]GWP-100 of Sulphur Hexafluoride (SF6) acc. To IPCC Sixth Assessment Report (AR6), 2023
[3]Besides vacuum and clean air, Fluoronitrile-mix is another discussed SF_6 alternative.
[4]Leakage rate of Fluoronitrile-mix is typically 0.5%

Phasing out SF_6 and other F-gas mixes is inevitable – clean air is the only future-proof option

Health and safety risks of F-gases

- SF_6 and fluoronitrile F-gas mixes produce toxic decomposition products during electric arcs and operation
- F-gases belong to the PFAS[1] group:
  more than 4,700 chemicals which accumulate in both humans and the environment, and which are highly persistent and toxic (negative health impact; contamination of water and soil).

Cost risks of SF_6 / F-gas regulations

- F-gas regulation (EU)[2]
- SF_6 ban California (CARB) / New York in discussion
- PFAS ban Maine (DEP) and Minnesota
- ECHA report[3] from 02.2023 includes a restriction proposal for PFAS-F-gases in switchgears starting 2026/27
- Worldwide institutions are following, e.g. Stockholm Convention (UN) or the Environment Protection Agency (EPA) having established a PFAS Council in the US

- **SF_6 is already restricted** and complete phase-out is more than probable
- **F-gases are under investigation** and restriction as well as a ban is possible
- **Clean air** does **not need any regulation** now or in the future

[1] Per- and polyfluoroalkyl substances
[2] The European Commission bans using PFAS and F-gases with a GWP >10 in switchgear (October 2023)
[3] European Chemicals Agency report

Stakeholders, legislation and regulations
Overview

Natural origin gases with GWP < 1 are 100% future-proof with no risk for regulatory exposure!

European Union

Revised F-gas regulation comes into force March 2024:
Prohibition of F-gases or F-gases with GWP ≥ 1
starting in 2026 in MV and 2028 in HV in switchgears

Taxonomy drives sustainable investments,
only switchgears with GWP < 10 compliant

Restriction proposal for PFAS[1] from 07.02.2023 includes a restriction proposal for switchgears starting in
2027 ≤ 145 kV and > 145 kV in 2033
EU committee opinion currently in progress –
results expected in 2024 or beginning 2025

United States

California (CARB[2]) law effective and **New York** state in discussion for SF_6 phase-out for new installations starting 2025 in MV and HV – adoption in other parts expected in next years

PFAS[1] restrictions: First laws effective – further decision and adoptions expected in next years

- EPA[3] placed a PFAS[1] reporting regulation from 12.11.2024 as a basis for further restriction regulations
- US state Maine placed a first PFAS ban from 01.01.2030
- US state Minnesota placed a PFAS ban from 01.01.2032

1 Per-and polyfluoroalkyl substances including C4FN and C5FK | **2** CARB: California air resources board | **3** EPA: Environmental protection agency

Replacing SF_6 in high voltage

We are doing it with clean air



Proven technology

Already 1,500 units with more than 20 million hours successfully in operation

Peak performance & safety

Highest switching performance, zero toxic by-products, fully compliant with IEC and ANSI/IEEE

GWP < 1

Clean air gives the equipment the lowest carbon footprint across its life cycle

Suitably sized

Our clean air units fit within the footprint of the SF_6 units they replace

Future-proof

Our Blue switchgear is the answer to the EU F-gas regulation GWP < 1

Siemens Energy welcomes the regulatory frame to cut CO_2 emissions for new installations:

Clean air insulation and vacuum switching technology is future-proof and not impacted by any restrictions or obligations with the revised EU F-gas regulation or expected PFAS restrictions!

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F-gas free products are available and in reliable use worldwide up to 420 kV, the majority rely on natural-origin gases to ensure safe power grids!*

1. F-gas free alternative technology & products **already available**
2. Manufacturers are committed to **close the portfolio gaps**
3. The proposed **transition time is sufficient to close and develop F-gas-free portfolio**

medium voltage	 ABB	 EATON	 efacec	 LS ELECTRIC	 MEIDEN	 MITSUBISHI ELECTRIC Changes for the Better	 nuventura	 ormazabal velatia	 TOSHIBA	 Schneider Electric	 SIEMENS	
high voltage	 ILJIN Electric	 Hitachi Energy	 MEIDEN	 MITSUBISHI ELECTRIC Changes for the Better	 TOSHIBA		 HSP	 PFIFFNER	 HYOSUNG HYUNDAI ELECTRIC	 SIEMENS energy		

*Natural-origin gases/F-gas-free with GWP <1

Source: Publications & web sites

● Factory in Europe

2. Siemens Energy Blue high-voltage portfolio

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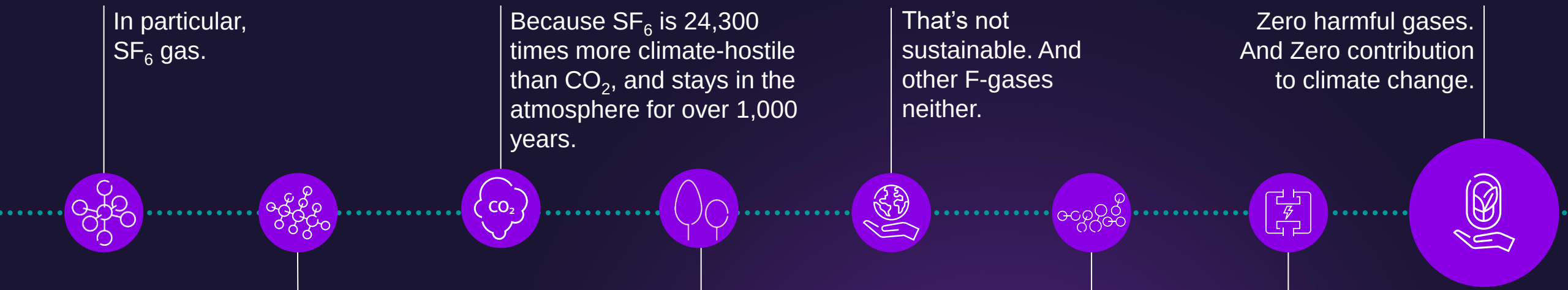
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Our Blue switchgear portfolio already offers a solution, with a greater mission in mind:

Achieving Zero emissions and Zero harm in energy transmission all over the world

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Until now, switchgear technology has typically used F-gases...



In particular, SF_6 gas.

But whenever technically possible, we must stop using these gases.

Because SF_6 is 24,300 times more climate-hostile than CO_2, and stays in the atmosphere for over 1,000 years.

To compensate for the annual global installations of SF_6 would take more than 19 billion trees.

That’s not sustainable. And other F-gases neither.

The only way to achieve carbon neutrality and Zero toxicity is by using clean air.

Zero harmful gases. And Zero contribution to climate change.

That's why our Blue portfolio uses clean air and vacuum switching technology.

Siemens Energy Blue has a clear Zero-compromise philosophy



Zero environmental impact

- Zero SF_6 and other F-gases
- Zero GHG emissions and Zero GWP
- Long lasting design (> 40 years) and circular materials



Zero impact on health & safety

- Zero toxic insulation gases
- Zero toxic decomposition products



Zero regulation & special handling

- Zero reporting & accounting of gases required
- Zero issues with current & potential F-gas regulation
- Zero special safety measures
- Zero gas disposal required at end of life



Zero compromise on performance

- Voltages from 72.5 to 145 kV
- Highest short-circuit switching capability with Zero degradation
- Full performance down to -60°C
- Maintenance-free interrupter unit („sealed for life“)

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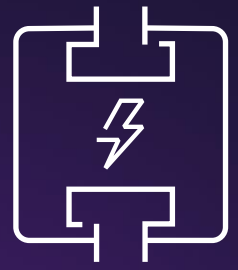
The Blue portfolio is based on game-changing technology: vacuum switching and clean air insulation

Clean air (N_2 + O_2) insulation



- Zero CO_2emissions, lowest CO_2 footprint, GWP = 0
- Zero toxicity, highest stability, easiest gas handling
- Zero liquefaction at low temperatures -60° C
- Zero patent dependencies, multiple suppliers

Vacuum interruption



- Zero toxic decomposition products, hermetically tight
- Highest switching performance w/o degradation, scalable short-circuit current capabilities
- Zero maintenance (sealed for life)

Clean, safe and future-proof regarding F-gas and PFAS regulation!

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The Blue portfolio comprises individual products & solutions, supporting our clients on their way to Zero

Up to 145 kV

Wind Tower and Offshore Blue GIS™

- 72.5 kV / 31.5 kA
- Optimized switchgear for application in wind turbines, with vacuum CB and clean air insulation



Blue Circuit Breaker™ Live Tank

- 72.5 kV & 145 kV / 40 kA
- World's first LT CB with vacuum interrupter and clean air insulation



Blue GIS™

- 145 kV / 50 kA
- World’s first 145 kV GIS switchgear with vacuum CB and clean air insulation
- Optimized footprint by using LPIT[1]



Blue Circuit Breaker™ Dead Tank

- 145 kV / 63 kA
- World’s first 145 kV DT vacuum CB with clean air insulation
- Same footprint as SF_6 product



Higher voltages (available)

Blue Clean Air GIB™

- 420 kV / 63 kA
- 245 – 400 kV = combined solution GIS + Blue GIB (30 – 65% less SF_6)



Blue Circuit Breaker™ Live Tank[2]

- up to 420 kV / 63 kV
- World’s first 420 kV LT breaker with clean air insulation
- Same footprint as SF_6 product



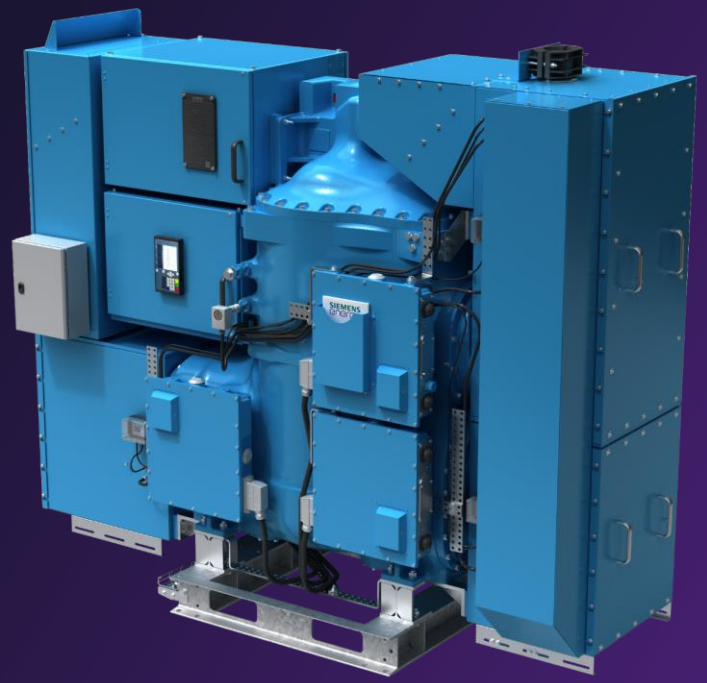
[1] Low Power Instrument Transformer
[2] available 2026

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Product one pagers

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8VM1 Wind Tower Blue GIS™ 72.5 kV / 31.5 kA



Product characteristics

- Vacuum interrupter technology | clean air insulation technology
- Weight of SF_6 or other fluorinated greenhouse gases = 0 kg
- Global warming potential = 0
- Expected product lifetime > 50 years | first major inspection > 25 years
- No reporting or emission costs during operation and recycling, e.g. taxes or CO_2 emission compensation (no SF_6 or F-gases)

Technical features

- Rated voltage up to 72.5 kV
- Rated frequency 50/60 Hz
- Rated short-circuit breaking current up to 31.5 kA
- Ambient temperature range -30 ºC to +45 ºC
- Stored-energy spring type driving mechanism of circuit-breaker
- Seismic withstand capability 0.5 g
- Leakage rate per year and gas compartment (type-tested) < 0.1%

Types / variants

- Indoor installation

Type tested

- Acc. to IEC / IEEE

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8VM3 Wind Tower Blue GIS™ 72.5 kV / 31.5 kA



Product characteristics

- Vacuum interrupter technology | clean air insulation technology
- Weight of SF_6 or other fluorinated greenhouse gases = 0 kg
- Global warming potential = 0
- Expected product lifetime > 50 years | first major inspection > 25 years
- No reporting or emission costs during operation and recycling, e.g. taxes or CO_2 emission compensation (no SF_6 or F-gases)

Technical features

- Rated voltage up to 72.5 kV
- Rated frequency 50/60 Hz
- Rated short-circuit breaking current up to 31.5 kA
- Ambient temperature range -30 ºC to +40 ºC
- Stored-energy spring type driving mechanism of circuit-breaker
- Seismic withstand capability 0.5 g
- Leakage rate per year and gas compartment (type-tested) < 0.1%

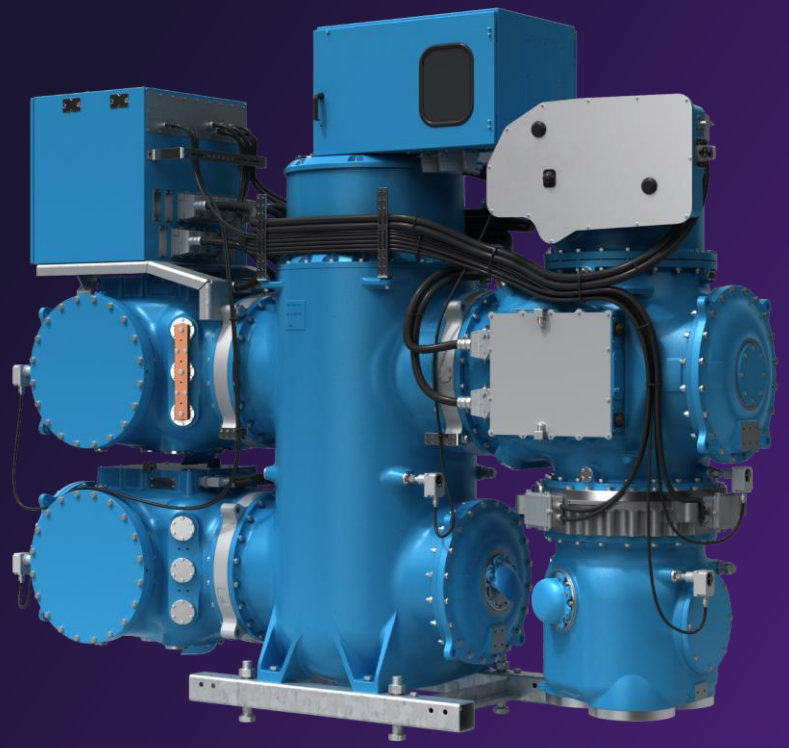
Types / variants

- Indoor installation for offshore wind turbines and offshore substations

Type tested

- Acc. to IEC / IEEE

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8VN1 Blue GIS™ 145 kV / 50 kA

Product characteristics

- Vacuum interrupter technology | clean air insulation technology
- Weight of SF_6 or other fluorinated greenhouse gases = 0 kg
- Global warming potential = 0
- Expected product lifetime > 50 years | first major inspection > 25 years
- No reporting or emission costs during operation and recycling, e.g. taxes or CO_2 emission compensation (no SF_6 or F-gases)

Technical features

- Rated voltage up to 145 kV, rated frequency 50/60 Hz
- Rated short-circuit breaking current up to 50 kA
- Ambient temperature range -50 ºC to +55 ºC
- Stored-energy spring type driving mechanism of circuit-breaker
- Seismic withstand capability 1.0 g
- Leakage rate per year and gas compartment (type-tested) < 0.1%
- Equipped with new Sensgear™ technology *(for more info see back-up)*

Types / variants

- Indoor and outdoor installation
- Optional with Low Power Instrument Transformer (LPIT) for reduced bay size / weight

Type tested

- Acc. to IEC / IEEE

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8VQ3 Blue Clean Air GIB™ 420 kV / 63 kA

Product characteristics

- Clean air insulation technology
- Weight of SF_6 or other fluorinated greenhouse gases = 0 kg
- Global warming potential = 0
- Expected product lifetime > 50 years | first major inspection > 25 years
- No reporting or emission costs during operation and recycling, e.g. taxes or CO_2 emission compensation (no SF_6 or F-gases)

Technical features

- Rated voltage up to 420 kV
- Rated frequency 50/60 Hz
- Rated short-circuit breaking current up to 63 kA
- Rated continuous current up 5000 A
- Ambient temperature range -50°C to + 55°C
- Leakage rate per year and gas compartment (type-tested) < 0.1%

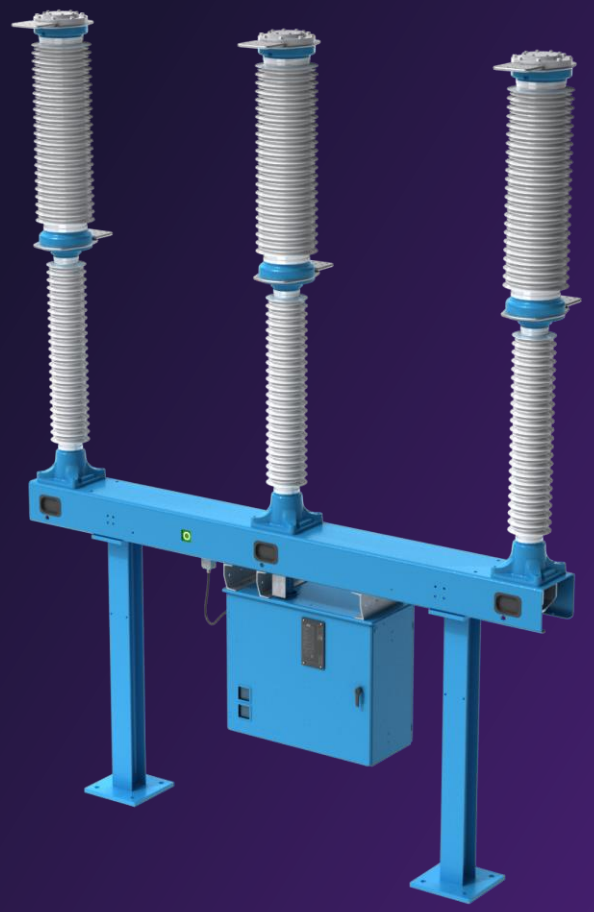
Types / variants

- Indoor and outdoor installation

Type tested

- Acc. to IEC / IEEE

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3AV1 Blue Live Tank Circuit Breaker™ up to 145 kV / 40 kA

Product characteristics

- Vacuum interrupter technology | clean air insulation technology
- Weight of SF_6 or other fluorinated greenhouse gases = 0 kg
- Global warming potential = 0
- Expected product lifetime > 50 years | first major inspection > 25 years
- No reporting or emission costs during operation and recycling, e.g. taxes or CO_2 emission compensation (no SF_6 or F-gases)

Technical features

- Stored-energy spring drive mechanism
- Rated voltages up to 145 kV, rated frequency for 50/60 Hz
- Rated continuous current up to 3150 A, rated short-circuit breaking current 40 kA
- Perfect for frequent breaking operations and extreme temperatures from -60 °C to +55°C
- 0.5 g seismic conditions, high terminal loads (2 kN stat. / 5 kN dyn.)
- Two-cycle current interruption
- Leakage rate < 0.1% p.a.
- Equipped with new Sensgear™ technology *(for more info see back-up)*

Types / variants

- Three-pole operation (FG) | composite insulators
- Also available as 60 Hz circuit switcher according to IEEE Std. C37.016

Type tested

- Acc. to IEC 62271-100, -110, -310

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3AV1 Blue Dead Tank Circuit Breaker™ up to 145 kV / 63 kA

Product characteristics

- Vacuum interrupter technology | clean air insulation technology
- Weight of SF_6 or other fluorinated greenhouse gases = 0 kg
- Global warming potential = 0
- Expected product lifetime > 50 years, first major inspection > 25 years
- No reporting or emission costs during operation and recycling, e.g. taxes or CO_2 emission compensation (no SF_6 or F-gases)

Technical features

- Proven reliable energy spring-drive mechanism
- Rated voltages up to 145 kV, rated frequency 50 / 60 Hz
- Rated continuous current up to 3000 A, rated short-circuit breaking current up to 63 kA
- Chopped wave (2 µs) voltage 838 kV
- Capacitive switching class (overhead lines and cables) C2
- Perfect for frequent breaking operations and extreme temperatures from -60 °C to +50°C
- Leakage rate < 0.1% p.a.

Types / variants

- Three-pole operation (FG)
- Composite insulators

Type tests

- Acc. to IEC / IEEE

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Coming soon
to the
Blue portfolio!



3AV2 Blue Live Tank CB up to 420 kV

Product characteristics

- Vacuum interrupter technology | Clean air insulation technology
- Weight of SF_6 or other fluorinated greenhouse gases = 0 kg
- GWP Global Warming Potential = 0
- Expected product life-time > 50 years | first major inspection > 25 years
- No reporting or emission costs during operation and recycling, e.g. taxes or CO_{2e} emission compensation (no SF_6- or F-gases)

Technical features

- Stored energy spring drive mechanism
- Rated voltages up to 420 kV, rated frequency for 50 / 60 Hz
- Rated continuous current up to 5000 A, rated short-circuit breaking current 63 kA / 80 kA
- Perfect for frequent breaking operations and extreme temperatures from -60°C up to +55°C
- 0.5 g seismic conditions, high terminal loads (3 kN stat. / 6 kN dyn.)
- Two-cycle current interruption
- Leakage rate < 0.1% p.a.
- Equipped with new Sensgear® technology *(for more info see back-up)*

Types / variants

- single-pole operation (FI) | Composite insulators
- Also available as 60 Hz circuit switcher according to IEEE Std. C37.016

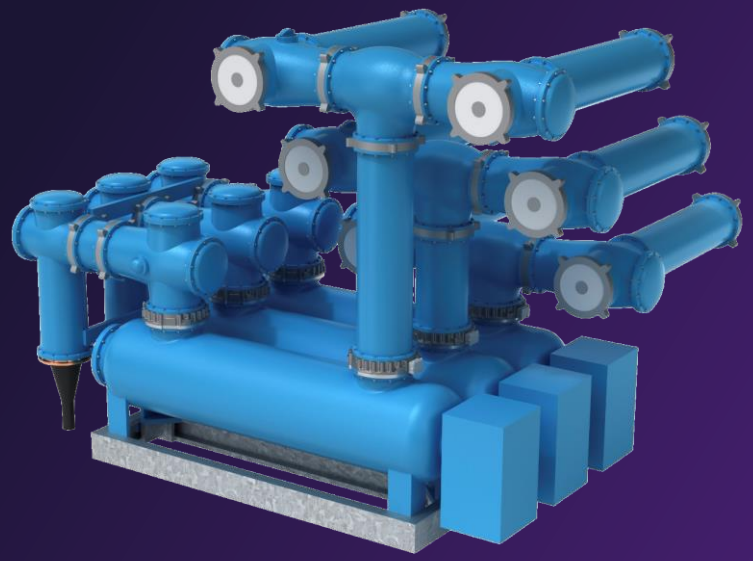
Type tested

- Acc. to IEC 62271-100

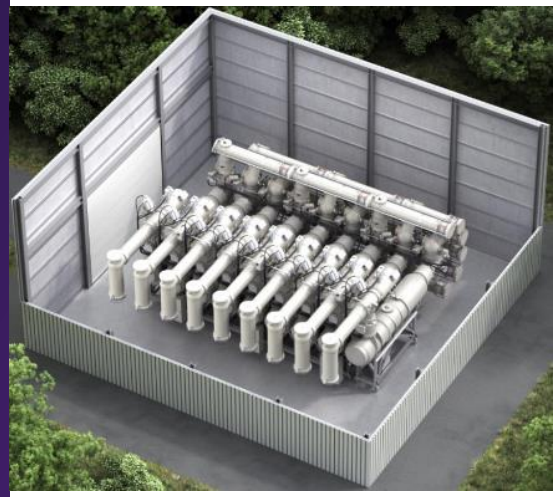
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8VQ3 Blue GIS 420 kV

Coming soon to the Blue portfolio!



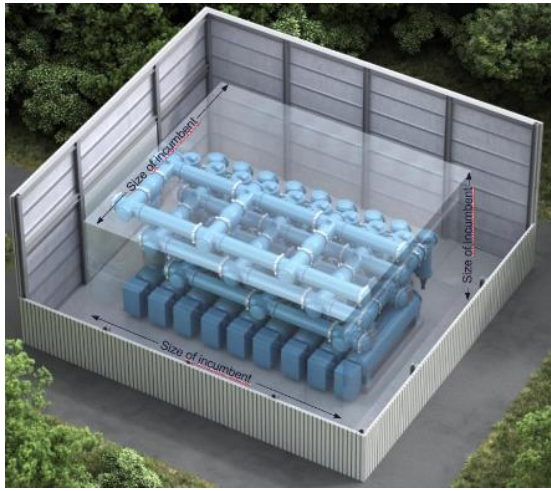
Exemplary comparison of footprint



Previous SF_6 generation (2010)



Current SF_6 generation



New design with clean air

Same bay width as previous SF_6 generation enables **easy replacement** and several **extension options**.

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3. Blue product evaluation

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Customer product evaluation criteria for switchgear products



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Three isolation mediums: a comparison



Vacuum / clean air

N_2 and O_2 (80% / 20%)



CO_2-F mix fluoronitrile[1]

$(CF_3)_2CFCN$



SF_6 sulfur hexafluoride

SF_6

[1] Fluor-ketone gas mix is not considered due to its inability to withstand temperatures below 5°C

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Criteria 1: Environmental impact



Vacuum / clean air

Zero greenhouse gas
GWP = 0
(Immediately absorbed)



CO_2-F mix fluoronitrile

Greenhouse gases
GWP ~ 500
(Lifetime 30 years)



SF_6 sulfur hexafluoride

Greenhouse gas
GWP ~ 24,300
(Lifetime 1,000 years)

Vacuum / clean air is the **most environmentally friendly** switching technology in the world

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Criteria 2: Health & safety



Vacuum / clean air

Vacuum: Zero decomposition products; sealed for life

Clean air: non-toxic decomposition products, non-hazardous

Gas leakage < 0.1% p.a./compartment



CO_2-F mix fluoronitrile

Toxic decomposition products (details unknown)

Hazardous (details unknown)

Gas leakage < 0.5% p.a./compartment (details unknown)



SF_6 sulfur hexafluoride

Toxic decomposition products

Hazardous when inhaled, causes skin and eye irritation

Gas leakage < 0.1% p.a./compartment

Vacuum / clean air is **non-toxic, non-hazardous** and does not require special safety systems such as ventilation or CO_2-monitoring

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Criteria 3: Performance



Vacuum / clean air

Vacuum circuit breaker can switch up to 30 times 40 kA currents

Zero degradation of short-circuit switching performance

From -60 °C to +55 °C



CO_2-F mix fluoronitrile

CO_2-F mix shows decreasing switching performance

Does not recombine completely after arcing

From -30 °C to +55 °C



SF_6 sulfur hexafluoride

SF_6 CB can switch up to 10 times 40 kA currents

Long term stability (SF_6 gas recombines)

From -40 °C to +55 °C

Vacuum / clean air offers the **highest short-circuit switching capability** without degradation and can be operated in a wide temperature range, being especially suitable for **very low temperature applications**

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Criteria 4: Gas handling & costs



Vacuum / clean air

Vacuum interrupter is sealed for life > Zero maintenance

No special tools, training, ventilation or reporting

No recycling or special EOL treatment necessary

Lowest lifecycle costs



CO_2-F mix fluoronitrile

unknown

Special tools, training, ventilation and reporting

No recycling option, disposal can cause extra CO_2

Higher lifecycle costs



SF_6 sulfur hexafluoride

Additional gas maintenance

Special tools, training, ventilation and reporting

Can be cleaned and re-used (extra effort)

Higher lifecycle costs

Vacuum / clean air is maintenance- and regulation-free and requires no special EOL treatment.
Overall it has the lowest lifecycle costs

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Criteria 5: Manufacturer competence

1970



First HV GIS with air insulation 170 kV

1976



First MV vacuum CB

2010



First HV vacuum CB with clean air 72.5 kV

2017



First HV vacuum GIS with clean air 72.5 kV

2017



First HV vacuum CB with clean air 145 kV

2018

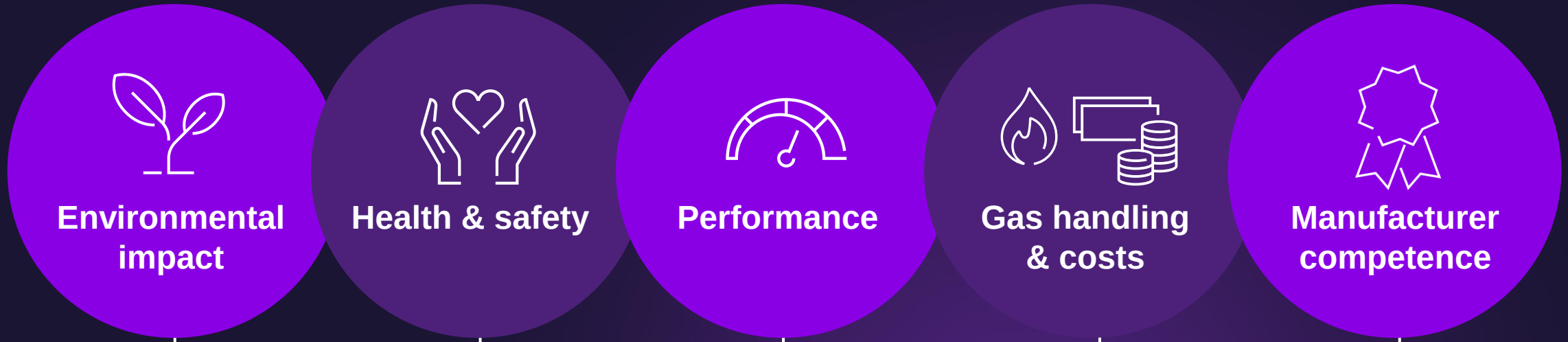


First HV vacuum GIS with clean air 145 kV

Design & engineering → **Manufacturing** → **Test lab** → **Supply** → **Installation, testing, commissioning** → **Training & after sales**

Siemens Energy has **over 50 years of experience** in switchgear with **global production** of 400,000+ GIS bays and 145,000+ CBs as well as more than **40 years of experience in vacuum and air insulation** technology

Customer product evaluation criteria for switchgear products

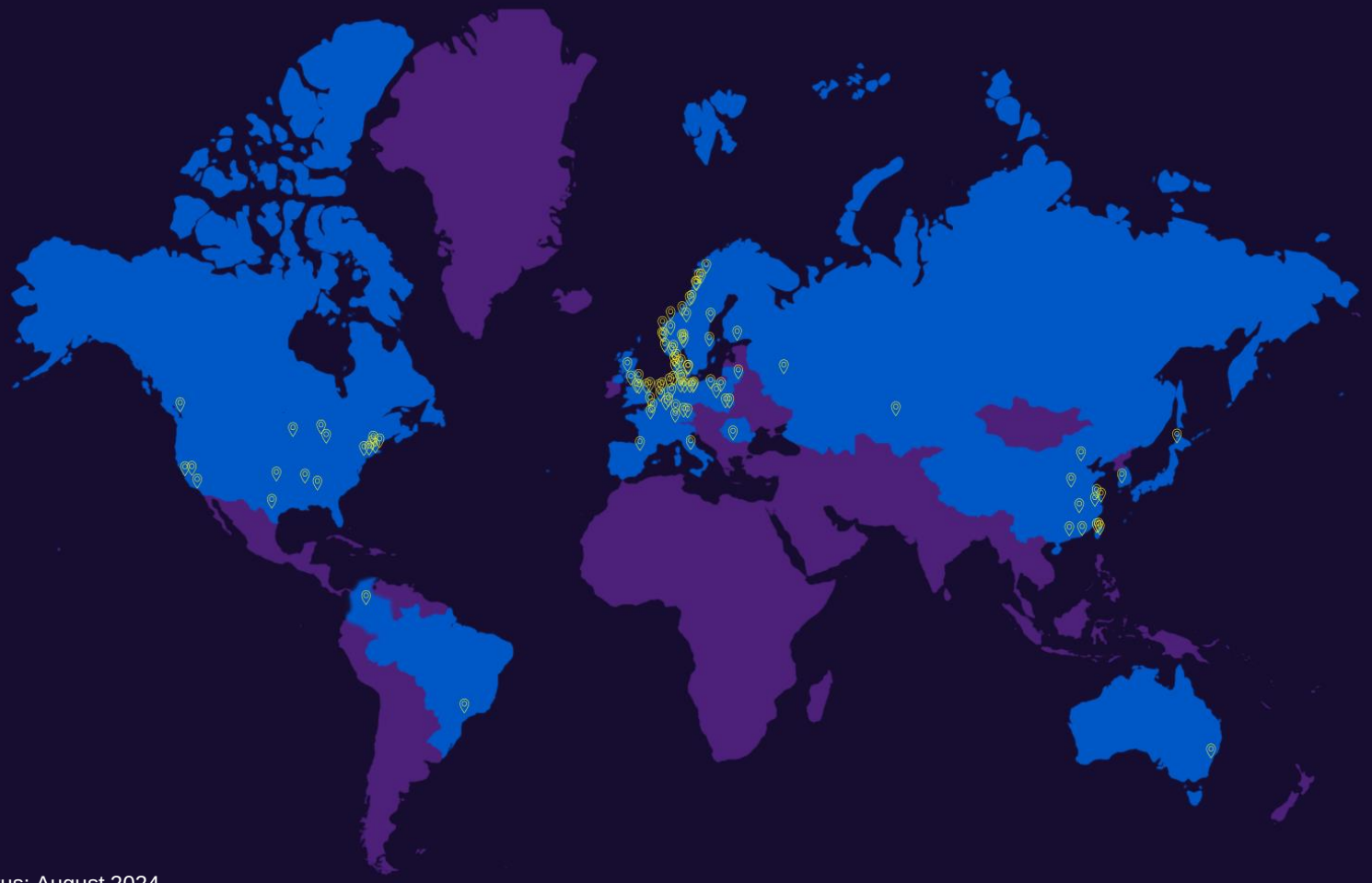


4. Blue success stories

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Zero-harm energy transmission is already becoming a reality around the world



> 30 million hours
of commercial operation

~ 6,000,000 tons
of CO_2-equivalent saved

> 4,900 units
sold

> 1,550 units
already in operation

Status: August 2024

Notable case studies

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Leading grid operators install clean air technologies



Globally around 4,900 Blue CB und GIS sold and 1,550+ units successfully in operation.

~6,000,000 tons of CO_2-equivalent saved

2010 72.5 kV	
2017 145 kV	
2017 72.5 kV	
2019 145 kV	
2022 145 kV	
2023 420 kV	

1 copyrights of company logos with the respective companies

A € 60 million investment in clean air technology

Key facts

- Transformation of 6,200 m^2 site in Berlin
- Production of vacuum interrupters for clean air Blue switchgear being ramped up
- Powered 100% by renewable energy
- Project announced: 2021
- Operational: 2024



Berlin factory

- Highly automated, fully digitally connected
- Entirely green energy supply
- Clear commitment to climate-neutral power transmission
- Major boost to local economy





Vacuum interrupter

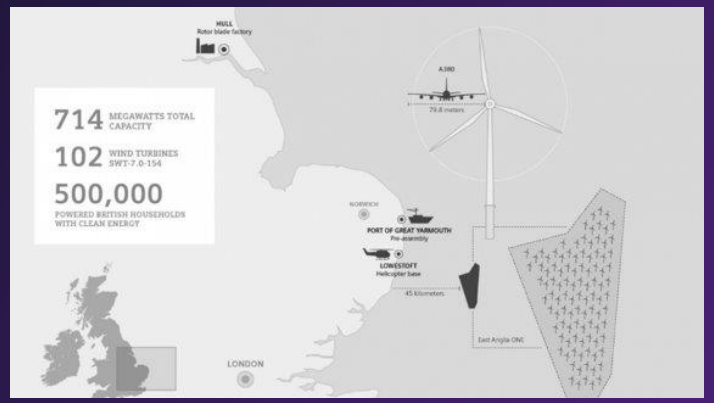
- Eliminate need for climate-hostile F-gases
- Enable Blue products to achieve Zero GWP
- Future-ready: not subject to EU F-gas legislation

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East Anglia ONE: the world’s largest order for an offshore wind power plant

Key facts

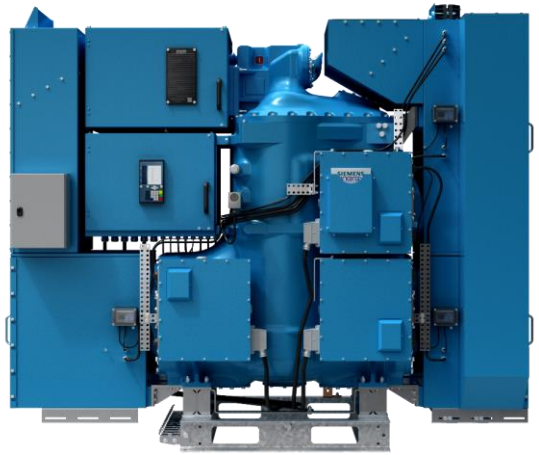
- Customer: Siemens Gamesa Renewable Energy for Scottish Power Renewables
- Offshore wind farm located off the east coast of England
- Operation of GIS requires no SF_6 or any other greenhouse gas
- Year of order: 2018
- Energization: 2020



Gas-insulated switchgear

- Installation of 102 bays of SF_6-free 8VM1 Blue GIS™ for 72.5 kV with a total capacity of 714 MV to power around 500,000 British households with clean energy
- Vacuum interrupter technology
- Clean air insulation technology





Customer benefits

- Zero direct CO2 emissions
- Easiest gas handling process
- Reduced quantities of cable
- Reduced cable installation times
- Improved efficiencies in power transmission

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The world's first SF_6-free high-voltage switchgear with clean air insulation

Key facts

- Customer: Netze BW GmbH, Germany
- Modernization of a 110 kV substation in Noerdlingen
- Operation requires no SF_6 or any other greenhouse gas
- Year of order: 2017
- Energization: 2018



Circuit breakers

- Installation of two SF_6-free 3AV1 Blue Circuit Breakers™ for 145 kV
- Vacuum interrupter technology
- Clean air insulation technology





Instrument transformers

- Six SVAA voltage and current transformers with clean air insulation

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The world's first SF_6-free gas-insulated switchgear with clean air and vacuum technology

Key facts

- Customer: BKK Nett, Norway
- Modernization of a 145 kV Koengen substation in Bergen – Norway's largest cruise port
- Operation requires no SF_6 or any other greenhouse gas
- Year of order: 2018
- Energization: 2020



Gas-insulated switchgear

- Installation of 3 bays of the 8VN1 Blue GIS™ for 145 kV
- Vacuum interrupter technology
- Clean air insulation technology





Low-power instrument transformers

- GIS includes low-power instrument transformers (LPIT) to ensure a compact design

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The world's first facility combining eco-efficiency and digitization

Key facts

- Customer: Netze BW, Burladingen, Germany
- Capacity of 80 MVA
- Blue portfolio goes digital with Sensgear™
- Year of order: 2020
- Energization: 2022



Gas-insulated switchgear

- Installation of five 8VN1 Blue GIS™ bays with low-power instrument transformers (LPIT)
- Vacuum interrupter technology
- Clean air insulation technology





Sensgear GIS

- Smart sensors record all relevant product operating data: gas pressure, temperature, and number of switching cycles
- Service life of around 40 years

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Hollandse Kust Zuid: an offshore project including the 1000th 8VM1 Blue GIS bay

Key facts

- Customer: Siemens Gamesa Renewable Energy for Vattenfall
- Offshore wind farm located just off the north coast of the Netherlands
- Operation of GIS requires no SF_6 or any other greenhouse gas
- Year of order: 2021
- Energization: 2023



Gas-insulated switchgear

- Installation of 140 bays of the 8VM1 Blue GIS™ for 72.5 kV
- Vacuum interrupter technology
- Clean air insulation technology
- Project including the 1000th 8VM1 bay





Customer benefits

- Zero direct CO_2 emissions
- Easiest gas handling process
- Reduced quantities of cable
- Reduced cable installation times
- Improved efficiencies in power transmission

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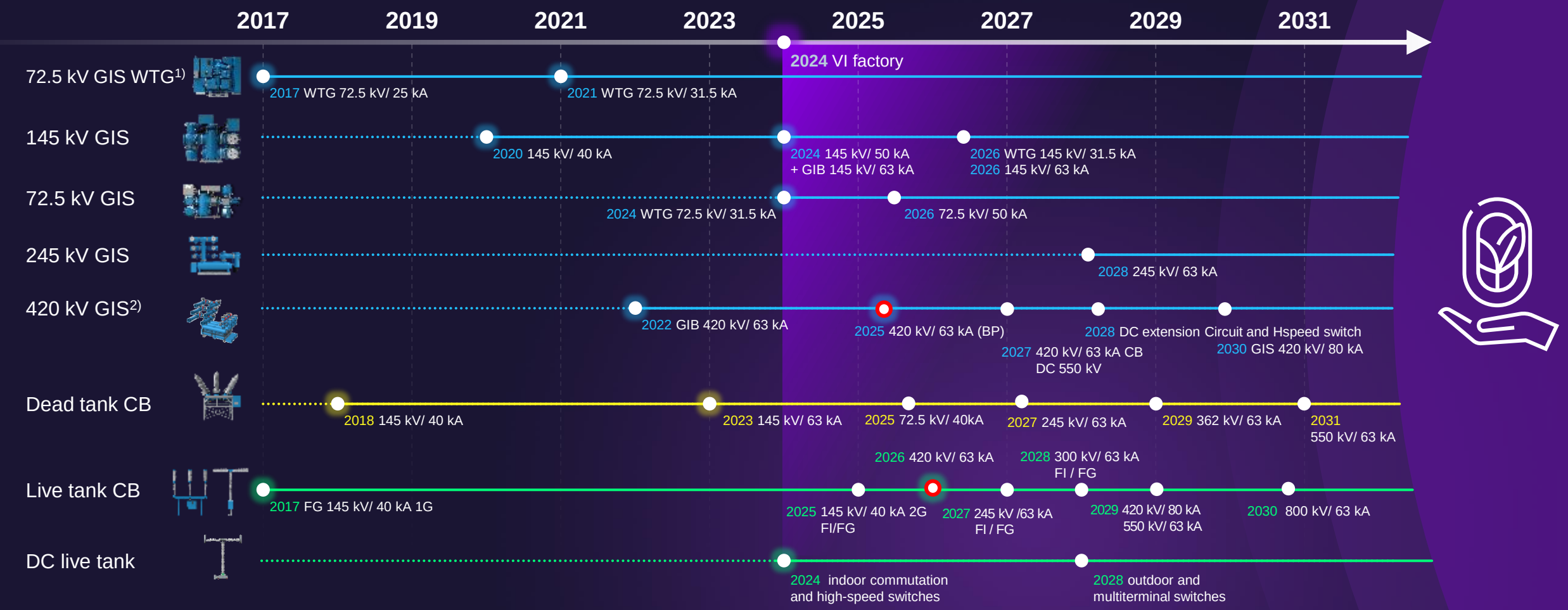
5. Outlook for the future

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Roadmap from Zero to Zero

Offering a fully F-gas-free, climate-neutral Blue portfolio by 2030



All dates/milestones shown as sales readiness | status: June 2024

Pilot sales now ready

Gas-insulated switchgear
Dead tank circuit breaker
Live tank circuit breaker

1) One CB
2) Double break

FI – Single drive
FG – Common drive

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Further reading:

- Siemens Energy Blue products
- Siemens Energy Blue partnerships & more

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Back-up

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From products to system intelligence: converting switchgear into Sensgear™

Besides general data such as local weather information or GPS location, the new technology provides also specific data:

Sensformer™ and arc suppression coil with Sensgear™

- oil level alarm
- top oil temperature
- low-voltage winding current

GIS and circuit breaker with Sensgear™

- gas density
- CB counter, position, readiness
- temperature (local control cubicle)

Surge arrester and disconnector with Sensgear™

- AR: surge counter
- AR: leakage current
- DS: drive current

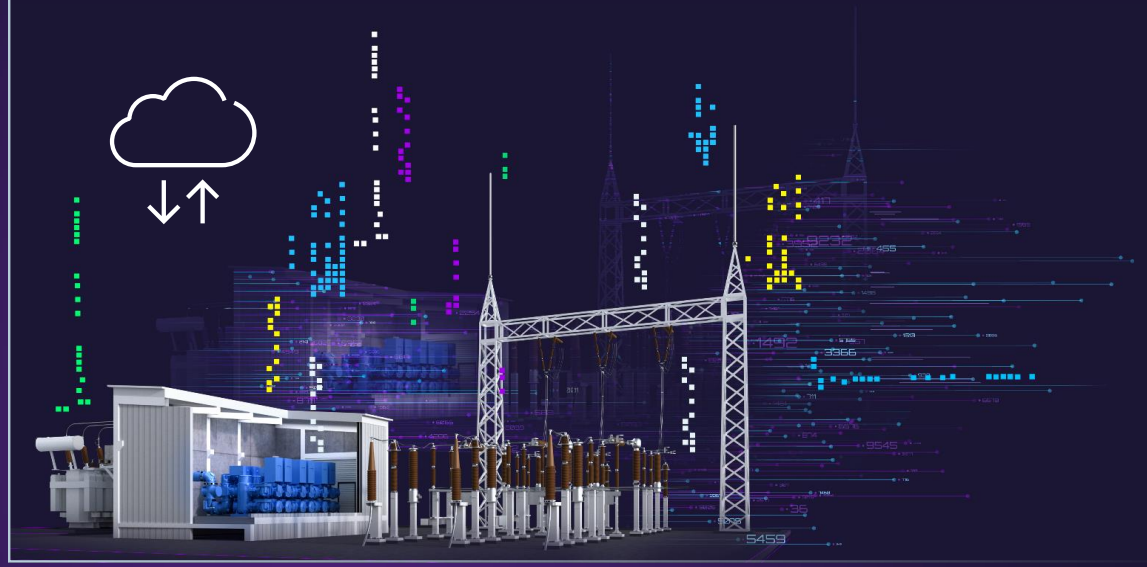
Instrument transformer with Sensgear™

- gas density
- oil level alarm

For more info click here

Added transparency, enhanced productivity and advanced intelligence:

- software apps and digital services
- data generation, collection, analysis and utilization
- secure data transmission through GSM to cloud with state-of-the art cyber security measures



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