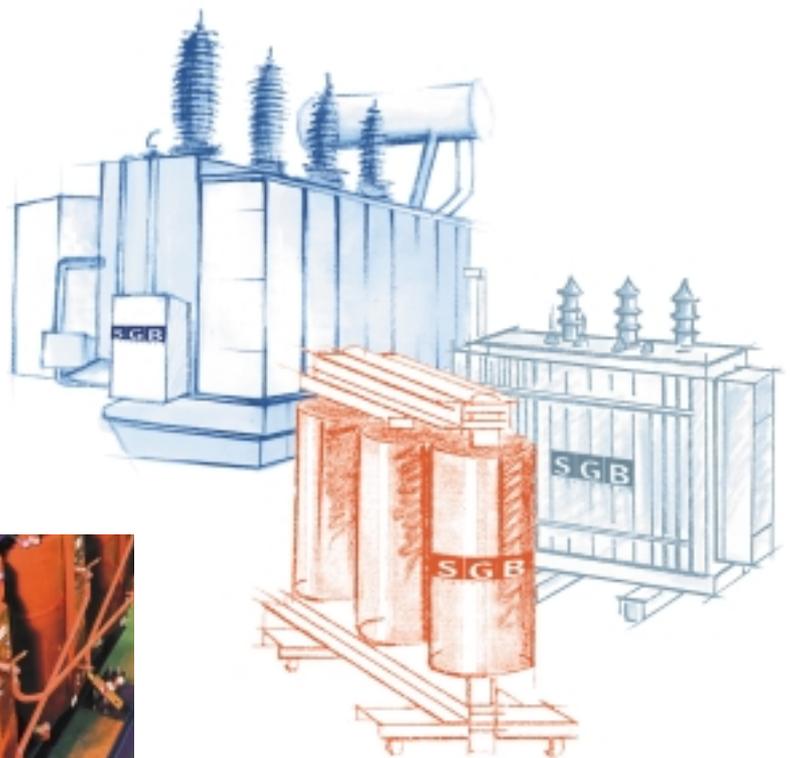




Partners in Power

Power in Starkstrom





Power in Starkstrom

"Power in Starkstrom" - the Starkstrom-Gerätebau (SGB) group uses this slogan in providing top performance in the field of power engineering. Our guiding principle, however, is far more than just stringing together catchwords. It sums up our corporate philosophy. It documents our position in the industry. And, above all, it represents an incentive and an obligation to fill this idea with life and power and to implement it in the form of our products and services.

We offer our customers a wide spectrum of products, ranging from transformers for energy supply (power transformers, oil distribution transformers, cast resin transformers) to professional project management and installation, as well as inspections to ensure reliable long term operation, in addition to further similar product services.

This way of thinking and our range of services are supported by more than 1,000 qualified employees, with whose help SGB has developed into one of the leading power companies in Europe in more than 50 years. However, the passage of time also requires commitment beyond the frontiers of Europe. For this reason we have taken up the challenge of globalisation with production plants in other countries, including countries in the Middle and Far East.

In order to be equipped for the future, we have also pointed the way ahead with respect to research and development. We benefit not least in this area from the synergetic effects accruing from fruitful cooperation with the companies of our powerful association: the shares of SGB are wholly owned by RWE Solutions, which is, in turn, owned by the RWE Aktiengesellschaft, Essen.

In November 2000, with the association of Smit Transformatoren B.V., Netherlands to the RWE Solutions Business Unit Transformers, the range of our products increased significantly, so that customers now have at their disposal a one-stop shop for transformers with capacities of up to 1,000 MVA and voltages of up to 525kV.

Our outstanding achievements, however, would not be possible without our customers and business friends, who repeatedly place their trust in us and help us to keep on developing our products and services. They would also be inconceivable without our staff, who do everything they can to be competent and reliable partners for our customers. We should like to thank them for this.

This interplay between customers and staff is also what makes us so successful:

Power in Starkstrom.



Corporate philosophy

Outstanding achievements require clear objectives. This is why our activities are oriented towards standards which, in the final resort, all have the same objective in view - the greatest possible benefit for our customers:

If you don't move with the times, you fall by the way.

Quality does not come by itself. Only constant further development and maintenance of the range of services guarantees access to future markets.

We rely on quality management.

The constant improvement in all operating processes, in the sense of total quality management, is an important objective of our company. For more than 50 years now our products and services have been subject to strict quality control - customer satisfaction. The development of the SGB group shows that we have passed this test. And since we are prepared to change in the course of time, in accordance with the expectations and requirements of the market, our quality management has also been certified according to ISO 9001 since 1993, and confirmed in annual audits.

We ensure that quality is good value.

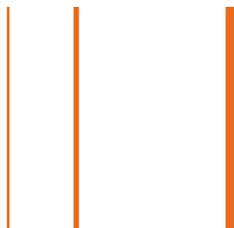
We are not a cut-price supplier, and do not intend to become one. But for us, planning, offering and implementing reasonably-priced solutions is an important element in our comprehensive orientation towards the needs of our customers.

We guarantee transparency and cost-effectiveness.

We are in favour of transparent offers and cost-effective solutions. This is why we take account of the costs not only for construction but also for operation and maintenance for the entire service life of the unit in question (life-cycle costing).

We develop the technology.

The further development of transformer technology is a permanent challenge for us. Even in the past, SGB, as a specialist in transformers, has had a great influence on the state of technology in Germany. In order to be able to offer further outstanding achievements for the benefit of our customers, we attach particular importance to continuous research and development. This requires considerable investment in technological innovations in our products. For example, we carry out computer simulations to show the vibration response of cores or to give thermographic illustrations of thermal behaviour.





Further training creates competence.

Only a qualified team can satisfy the high demands set by our customers. For this reason we attach great importance to the professional training and education of our personnel. Specialist apprenticeship training ensures that we always have new generations of experts with the required knowledge. Besides technical training, the personal development of our staff also rates highly.

Safety, environmental awareness and health are important to us.

Since human health and the preservation of our environment have top priority, we take diverse measures to achieve these objectives.

Our most important objective: the greatest possible benefit for the customer.

In the long run, you can only survive tough competition if you are better than the others. This is why we offer our business partners the best service possible: high product quality, schedule effectiveness, customer service, cost effectiveness, value maintenance and environmental awareness.

The main focus is on the personal aspect.

People and not machines represent the focus of attention of all of SGB's activities, for the usefulness of our activities for customers and staff is a central corporate purpose. We have more than 1,000 well-trained, highly-motivated and loyal staff members, who form the foundations of our outstanding achievements. One important aspect here is individual responsibility, for in the final resort the implementation of corporate objectives can only be achieved by the individuals themselves.



Power transformers

Since 1960 almost 2000 power transformers have been built in Regensburg and are now working on the grid systems of our customers. We pride ourselves on having a longstanding and close relationship with our customers who state that SGB power transformers are very reliable with a failure below 0,36 % as indicated in specialized literature.

Know-how as the standard

There is hardly a problem that we have not solved, hardly a version that we have not built, for many years' experience in the field of power transformers makes you variable, creates flexibility and gives you a high degree of problem-solving ability. We can thus satisfy practically all customer requirements:

Our power transformers are produced with ratings of 5 to 100 MVA and for service voltages of up to 170 kV.

To adapt the voltage, it is possible to provide on-load tap changers for max. 22% tapping range for adjustment in 27 steps under load, or off-load tap changers for 5% tapping range for adjustment off circuit.

Frequently used vector groups are YNd5, YNd11 or Ynyn0, YNyn6 with and without delta stabilising windings.

Quality in protection, safety and durability

Our customers appreciate our high level of technical know-how and the absolute reliability of our transformers. To guarantee this, day by day, we use the best thing we have: our knowledge. We use this knowledge to achieve a high level of operational reliability and long service life in our transformers. Constant checks also ensure a high quality standard:

For example, we select the corrosion protection in accordance with the relevant installation and environmental conditions to ensure freedom from maintenance for many years.

We observe standards and regulations in our designs, e.g. VDE 0532, IEC 76, SEV 3156, ÖVE M 20, as well as the VDE 0536 and IEC 354 provisions relating to overload and emergency operation.

We optimise no-load losses, short circuit losses and noise emissions depending on the requirements.

The principal dimensions and equipment meet the requirements of DIN 42 504, DIN 42 508 and TLV. It goes without saying that we comply with customers' additional specifications.

We design vacuum-proof and pressure-resistant tanks, expansion vessels, radiators, bushings etc., taking account of the type of transport, installation conditions and special regulations. Here too, of course, we pay particular attention to our customers' wishes.

Perfectly matched

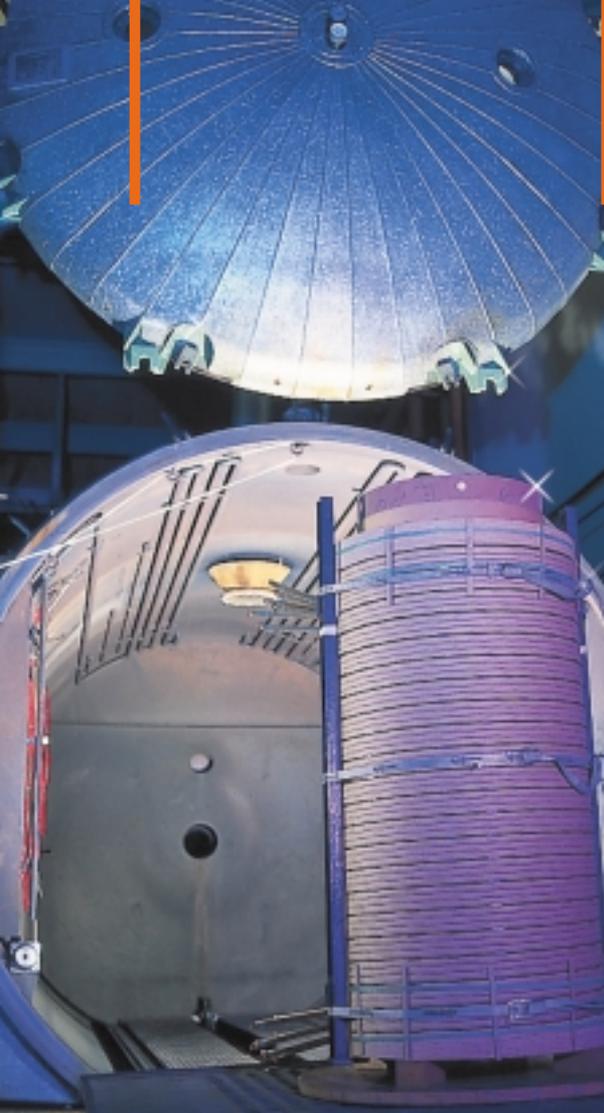
Cores, winding, on-load tap changers, terminal leads and clamping structures are subject to enormous stress during the period of operation of a transformer. It is important that all elements should interact smoothly and correctly. With the help of special computing programs we can compare all of the available materials and match the components to each other.

Details make the difference.

Experience creates competence.

Knowledge means safety.





Sophisticated technology

We combine high-grade materials, the latest construction elements, sophisticated manufacturing processes and top-quality workmanship to produce perfect technology:

Know-how pays off.

For example, the boltless core consists of high-quality, cold-rolled, grain-oriented transformer sheets.

The windings are produced using modern machines with predefined tensile force and fixed clamping force.

After predrying, several clamping operations guarantee the strength of the winding.

The drying process according to the VD method removes all of the moisture from the core-and-coil assembly.

Power worldwide

Quality knows no bounds. Our sophisticated know-how and our flexible problem-solving competence allows us to tackle difficult conditions as well. Even at the design stage we take account of special transport and installation conditions. This is why you will find power transformers with the SGB mark of quality all over the world. A fact of which we are quite proud.

There is nothing to beat quality.





Oil distribution transformers

Since August 1993, Sächsisch-Bayerische Starkstrom-Gerätebau GmbH (SBG) as a wholly-owned subsidiary of SGB has been producing oil distribution transformers in Neumark in Saxony. This new plant, with the latest in infrastructure and built on undeveloped land, guarantees production at the highest technical level.

Tested quality cuts
running costs

Production at the highest technical level

For our durable oil distribution transformers we use only high-grade production materials and attach very great importance to sound workmanship, for the higher the material processing quality, the lower the running costs. The result is maximum transformer availability together with low maintenance. Reduced no-load and load losses increase cost-effectiveness and also lead to a significant reduction in noise emissions. The power range offered on the market is between 50 kVA and 5 MVA.

Our distribution transformers are characterised by:

- high cost-effectiveness
- sound workmanship
- large power capability
- tested quality
- high-grade materials
- comprehensive after-sales service system.

Sturdy: core and winding

The iron core of our oil distribution transformers is made up of cold-rolled, grain-oriented magnetic sheet steel using "step-lap" staggering technology. As for the winding, the tried and tested combination of LV foil winding and HV layer winding ensures ideal performance data and ideal impulse voltage distribution. On account of the LV foil winding, axial current distribution can adjust itself as required in the foil conductors. Thrust is thus largely avoided, and axial contraction forces cannot act in the foil conductor. The HV layer winding is extremely compact, shows good short-circuit behaviour and optimum impedance voltage distribution.

Ideal in all positions.

Durability as a construction principle

The implemented construction principles and production methods have been tried and tested over many years. Our transformers are thus characterised by a high degree of operational reliability. Our customers can thus expect an extremely long service life when using oil distribution transformers. With our oil distribution transformers we naturally attach particular importance to effective corrosion protection.

Protected and durable.





Comprehensive quality inspection

Every oil distribution transformer is thoroughly checked by us in accordance with the relevant regulations before it leaves the factory.

We inspect:

- temperature rise in the winding
- noise values
- impulse withstand capability
- short-circuit withstand capability.

In addition, a series of inspections to accompany production is carried out and documented on the basis of the quality management system certified by the Bavarian TÜV (Technical Inspectorate) in accordance with ISO 9001.

Checked unit by unit.



Lahmeyer-Compactstation®

Package Solution

Lahmeyer compact stations have been in the Neumark based SGB line of products since July 2000.

Production is carried out in a newly build plant hall. The entire know-how as well as the responsible members of the staff from the technological and sales areas were transferred from Piller Mechernich to SGB, Neumark. In this way, a forty-year tradition in the development, the construction and sales of metal-cased compact stations is being successfully continued at a reliable and efficient transformer manufacturer.

The solution offers the following beneficial features:

- Stability
- Low weight
Complete station including equipment and 630 kVA transformer equals approx. 3,400 kg.
- Transformer room accessible via plug-in panels on both sides or via the roof.
- Front doors,
Left-hand or right-hand door opening, variable Opening angle 90° and 135°
- Construction-site power / emergency power entry
- The steel foundation, approx. 320 kg., hot-dip galvanised, 100% pore-free double powder coating (zinc power, covering layer), is designed as a modular base unit, patent pending.
- Oil trap, stainless steel, 3 mm thick, without contact to the ground, leakage test can be carried out from the outside
- Cable entry via floor plates
- Laying of cables or other service lines can be carried out within the foundation structure

Overall an extremely reasonably priced, installation-friendly and environmentally compatible solution.

Complete and Compact



Cast resin transformers

Thanks to their design, SGB cast resin transformers offer a number of outstanding properties which make them extremely cost-effective, reliable and safe solutions, particularly in industrial plants.

Cost-effective and environment-friendly.

Excellent performance

Ratings of up to 24,000 KVA in circuit voltage classes of up to 36 kV are within the SGB standard. It goes without saying that they are without coolant and environment-friendly. For this reason they are also frequently used as pole-mounted transformers, particularly in protected water catchment areas.

Through the paces

Our cast resin transformers are products of the highest quality. High-grade materials together with sound workmanship ensure maximum reliability in the supply of energy. The iron core consists of cold-rolled, grain-oriented magnetic sheet steel, the "step-lap" staggering technology permits a favourable transition of the magnetic flux from the limbs to the yokes. This leads to a considerable reduction in no-load losses and noise values. A comprehensive quality check before delivery is a matter of course. We test each individual transformer carefully before it leaves our factory, measuring and documenting all nominal values in accordance with the relevant regulations.

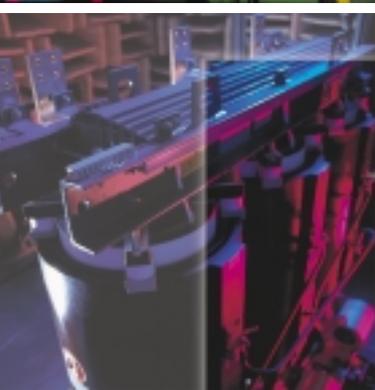
Tried and tested.

Not a burning question

SGB cast resin transformers are extremely resistant to fire: the independent expertise by the Association for the Promotion of Fire Protection in Germany (Vereinigung zur Förderung des Deutschen Brandschutzes e.V., VFDB) shows that ignition using simple means is practically impossible.

Our cast resin transformers have all electrodynamic forces under control. The winding insulation of the LV foil winding is effected using insulating sheeting (so-called prepreg). After winding, copper foil and prepreg are baked to give a compact, short-circuit-proof winding. A further advantage is that in the event of a short-circuit, the foil winding reduces radial stray fields and also keeps radial electrodynamic forces under control. The HV layer windings are encapsulated free from shrink holes and are hardened without cracks. Axial forces cannot have any effect here either.

Safe and reliable.



Further properties of cast resin transformers are:

- mould-based vacuum casting
- freedom from partial discharge < 10 pc
- cooling-air ducts minimise temperature rise
- glass-fibre material ensures high mechanical strength
- we use epoxy resin to impregnate the glass-fibre insulation. The mixture is exactly tailored to meet the requirements of each transformer.

Ageing tests on model windings at high temperatures or in extreme environmental conditions show:

- The encapsulation is of extremely high quality.
- The reserves for temperature rises are high.
- The insulation system exceeds Class F and complies with the American class 150 C/40000 h.

Variable solutions

The flexible modular system of the SGB standard housings allow the creation of safe and easily networked load-centre substations, which permit many variable solutions:

- Our cast resin transformers can be set up directly at the energy load centre, brickwork transformer cells are not required.
- Protection types IP20 to IP33 are possible.
- Special ventilation elements allow the transformers to be set up in the open air, for example on the roofs of buildings.
- The sturdy bolted constructions can be dismantled completely.
- A combination of fans mounted on the transformer clamping frame and a roof-mounted fan unit allows an overload of 40%.
- Fans can be retrofitted at any time, air partitions are not required.

Simple and flexible.

Advantages that speak for themselves**Favourable installation costs:**

Since the fire risk is low, the transformers can be set up at the load centre. This saves investment and energy costs.

High degree of flexibility:

Neither an oil sump nor fire bulkheads are required. The selection of the installation site is therefore highly flexible and does not have to be laid down during construction planning.

Low maintenance:

Maintenance work such as sealing, touching up tank corrosion protection and oil treatment is not necessary. Our cast resin transformers require only air as a coolant, no oil level monitoring or oil treatment is required.

Adequate power reserve:

SGB cast resin transformers can easily absorb brief overloads, for example when starting up motors or during welding. And the installation of a fan makes even permanent overload possible.

A wealth of experience:

SGB quality has proved itself, with over 10,000 units installed.

Powerful.

Special transformers and solutions to electrotechnical problems

Special requirements make special solutions necessary. For such requirements, the Starkstrom-Gerätebau group offers special transformers and inductive components.

Furnace transformers

Supplying arc melting furnaces makes very high demands on transformers: the windings must be strong enough because they are subject to very high dynamic stress caused by short-circuit current forces, and a large control range is required. No problem for SGB!

- We have the necessary know-how and many years' experience in the design and construction of furnace transformers for rated power values of up to 80 MVA.
- Rated current values of up to 70 kA represent no problem.
- SGB furnace transformers can be built up to 120 t.

Coupling units for audio-frequency remote control systems

Audio-frequency remote control systems are a reliable and proven solution for the remote control of devices in supply networks. We can supply coupling units for the serial and parallel supply of audio-frequency remote control systems in 110 kV and 20 kV supply systems.

Transformers with in-phase regulation and regulation in quadrature

The system management often requires the interconnection of medium-voltage systems that are supplied from different high-voltage systems. In such cases, a voltage that can be regulated in direct-axis and quadrature-axis components must also be generated at the interface. This problem is solved by our transformers with in-phase regulation and regulation in quadrature.

Components and systems for neutral-point connection

Medium-voltage systems in Europe are largely operated as resonant-earthed systems. SGB offers a complete range of products for the necessary neutral-point connection:

- arc suppression coils
- fixed coils, off-circuit variable tapped coils as well as coils variable under load. The variable coils can be operated with the fitted electronic regulators and have an automatic mode
- neutral electromagnetic couplers
- earthing transformers
- earth fault combinations consisting of neutral electromagnetic couplers and arc suppression coils

In particular cases the use of oil-filled devices is restricted for environmental reasons. In these cases, SGB can help to solve the problem with cast resin neutral electromagnetic couplers and arc suppression coils.

Solutions to all kinds of problems.



Technical services



Replacement and disposal

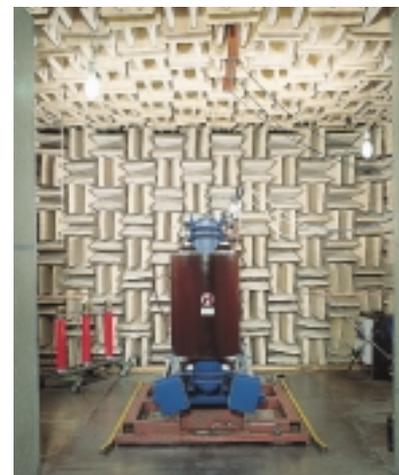
A high level of coordination and administration is required when replacing and disposing of PCB transformers. On the one hand many different statutory regulations must be complied with, and on the other hand company interests have priority.

Many years of experience in this sector have given SGB a great deal of system know-how. Together with reliable partners, we are in a position to offer our customers for PCB transformers an attractive delivery and service package: logistics, installation and recycling - all from one supplier.

Service - from one supplier.

Servicing, maintenance, repair

Even after the delivery of transformers, we stay in very close contact with our customers with a wide range of services: our specialists in decentralised plants are close enough to our customers to carry out maintenance and repairs. Furthermore, maintenance work and, if technically possible, repairs on the transformer site are part of our range of services.



SGB - a historical review



1947

Energieversorgung Ostbayern transfers the Konkordia shares in the company to the Aktiengesellschaft für Energiewirtschaft (AFE).
Not only the owner but also the name changes. The company now trades under the name of Starkstrom-Gerätebau GmbH (SGB).

1952

New buildings for transformer production, today the transformer repair division; beginning of machine repairs on a large scale.

1956

Delivery of the 5,000th transformer.

1960

The 10,000th transformer is completed.

1961

Beginning of the construction of the new transformer factory, expansion of the production range (power transformers up to 100 MVA).

1962

A further shareholder joins the company: Lahmeyer AG (LAG) acquires 40 % of the shares in SGB, AFE owns a 60 % share.

1966

Completion of the 20,000th transformer.

1971/72

Renewed extension of the entire transformer production premises.

1975

Commissioning of the machine repair plant in Obergartzem.

1979

Beginning of the construction of cast resin transformers.

1982

New buildings for machine repair plant in Regensburg.

1986

Merger of Aktiengesellschaft für Energiewirtschaft and Lahmeyer AG to form Lahmeyer Aktiengesellschaft für Energiewirtschaft. Lahmeyer Aktiengesellschaft für Energiewirtschaft owns all shares of SGB.

1990

Purchase of Transformatorenwerk Reichenbach GmbH (TRR) from the German Trust Agency, establishment of the subsidiary Sächsisch-Bayerische Starkstrom-Gerätebau GmbH (SBG) in Neumark/Saxony on 17th August 1990.

1991

Cornerstone ceremony for a new SBG plant in Neumark.

1993

SBG starts production in Neumark.

1994

Establishment of the joint venture company AMMSGB in Malaysia on 8th July 1994.

1997

Merger of Lahmeyer Aktiengesellschaft für Energiewirtschaft with Rheinelektra AG to form Lahmeyer Aktiengesellschaft, Frankfurt. Completion of 110,000th transformer.

1999

Foundation of TESSAG, Technische Systeme und Services Aktiengesellschaft.

2000

Acquisition of Smit Transformatoren B.V. by TESSAG Niederlande.

2001

TESSAG trades as RWE Solutions



Manufacturing range

Manufacture and delivery:

- Oil immersed transformers up to and including 1.000 MVA, service voltage up to 525 kV in compliance with all relevant standards and for special designs
- Regulating transformers with onload tap changers
- Cast resin transformers up to and including 24 MVA, rated voltages up to 36 kV
- System enclosures for cast resin transformers
- Transformers with line drop or parallel regulation
- Pole-mounted transformers
- Earthing transformers and Petersen coils
- Rectifier and furnace transformers
- Resonant-circuit reactances, coupling transformers and reactors for AF ripple control systems
- Shunt reactors and current limiting reactors
- Compact substations

Subject to technical modifications

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