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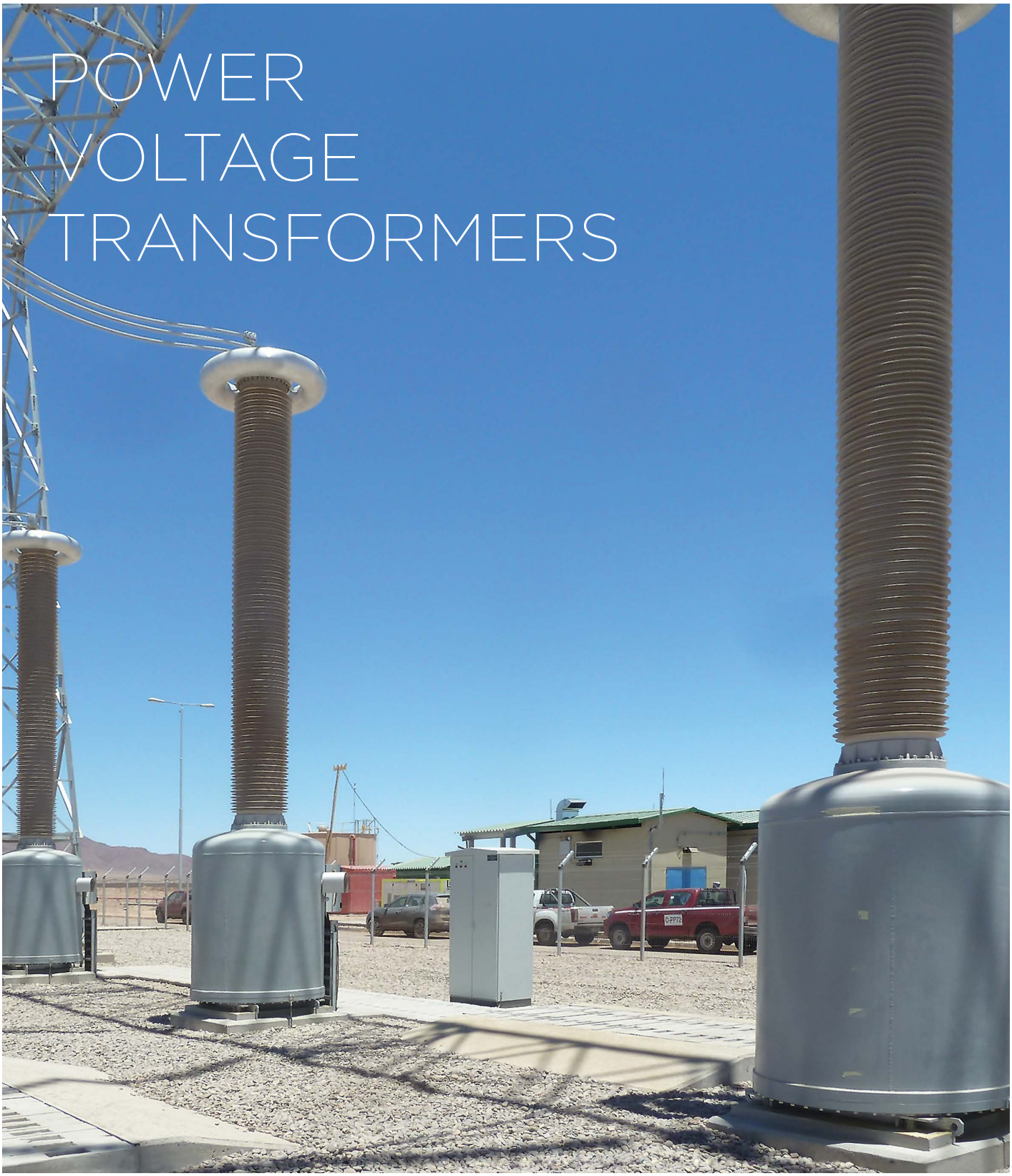
POWER VOLTAGE TRANSFORMERS



INTRODUCTION

Power Voltage Transformers (PVT) also known as Station Service Voltage Transformers (SSVT) are used to supply Low Voltage power directly from a High Voltage line up to 550kV. Located within the own substation they can provide power up to 333kVA per phase in a reliable and cost-effective way. They offer a wide range of applications, but they excel when substation auxiliary service power supply is needed in remote areas, making them an ideal solution for Renewable Energy substations.

PVTs were firstly used in North America decades ago. Due to the nature of the electrical network, SSVTs were intended to cover the auxiliary power supply needs in switching substations where neither a Power Transformer or a distribution line were available. Since then, the power output capabilities and the applications have expanded dramatically mainly for Renewable Energies.

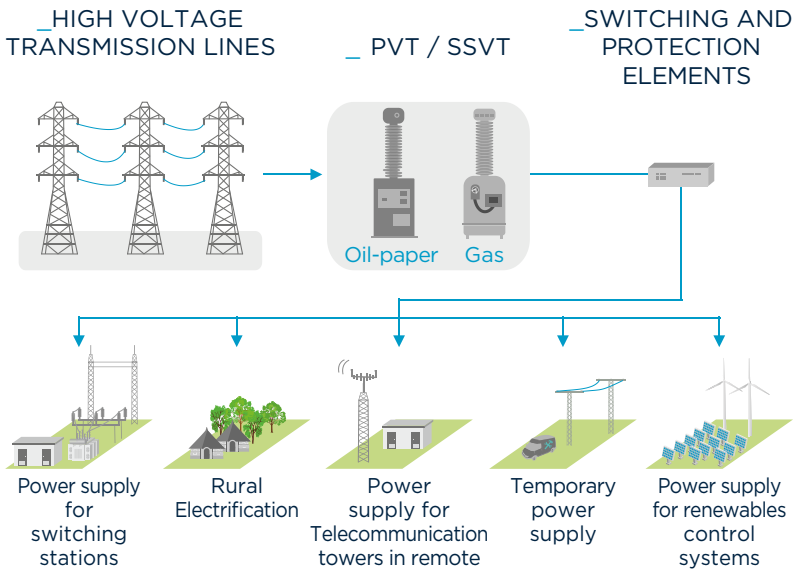
Low Voltage power supply from High Voltage line:
_Up to 333 kVA per phase.
_Up to 550 kV.

Oil-paper or SF_6 insulation.

BENEFITS OF THE PVTs

- Highly **reliable** power supply on site at the substation.
- **Independent** auxiliary services supply.
- **Cost** effective over the conventional solutions.
- **Maintenance-free** and long-life design.
- **Flexible, quick** and easy installation.
- Does **not** entail **risk** for the Power Transformer by using tertiary for LV applications, and it´s free for other applications.
- **Social benefit**. Rural isolated area electrification, emergency supply after natural disasters...
- **Design flexibility**. Different secondary voltages available. Independent secondary windings.
- **Self-contained power** directly from the transmission line.
- High **seismic performance**.
- Additional capabilities such as Metering and/or Protection and Line discharge.

MAIN APPLICATIONS



OTHER APPLICATIONS

- Temporary power supply for under construction substations, wind farms, etc.
- Mining.
- Railway substations.
- Lighting of towers.
- Oil & gas pumping stations.
- Small solar farm step up transformer.
- Voltage elevator.

PVTs IN A RENEWABLE ENERGY SUBSTATION

High Voltage substations are needed to connect renewable energy generation plants such as wind or solar farms, to the main transmission network. These power plants are usually located in isolated areas, so a brand-new infrastructure is often needed (substation, transmission lines, and the like).

These substations need redundancy for auxiliary services with a primary and a back-up source in order to power up control and protection equipment, air-con, lightning, security systems, etc. All these services need single or three-phase low voltage power. Depending on the size, location and climate conditions, the LV power needs range between 100-500kVA.

A transmission line connecting this substation to the main transmission system is therefore needed with a typical voltage ranging from 115 to 500kV.

PVTs are located within the HV switchyard, and they can be connected in the busbars or at the entrance of the line, depending on the overall substation design.

Benefits of the PVTs in a Renewable Energy Substation

Reliable power supply: Since the PVTs are connected in the high voltage switchyard of the substation, there will be power available as long as the line is energized. Since this line is connected to the main transmission system, the power availability is guaranteed.

Maintenance free: PVTs don´t need maintenance, this is an advantage, considering that these substations are in remote locations and might not be easily accessible to maintenance crews.

Quick commissioning: Delivery time from the factory is similar to the rest of the HV switchyard equipment (circuit breakers, instrument transformers, disconnecting switches or surge arrestors), and the commissioning of the equipment is relatively simple, similar to that of instrument transformers. In addition, it can already supply power while the rest of the substation or windfarm is being constructed, as long as the HV line is already energized.

Environmental impact: PVTs are part of the HV switchyard, so other than that they do not represent any additional environmental impact. This is particularly remarkable when they are part of a renewable energy project. The units are hermetically sealed avoiding insulation fluid leakages to the environment.

Cost effective: Compared to the other alternatives PVTs are in most of the analyzed cases a cost-effective solution.

Comparison between PVTs and conventional solutions to supply auxiliary power to renewable energy substations

	Initial Cost	Life cost	Reliability	Maintenance	Environmental impact	Commissioning time	Independence
PVT	oo	-	ooo	-	-	o	ooo
Distribution Line + Distr. Transformer	ooo	o	oo	o	oo	ooo	o
Diesel Generator	o	ooo	oo	oo	ooo	o	o
PT Tertiary	oo	-	ooo	o	-	oo	ooo

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Moving together

COMPLETE RANGE

Oil-paper insulation > Model UTY

Model	Highest Voltage (kV)	Rated insulation level			Max. Power Output per phase (KVA)	Standard creepage distance (mm)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)		
UTY-72	72.5	140	325	-	10	1825
UTY-145	145	275	650	-	16	3625
UTY-245	245	460	1050	-	10	6125

Oil-paper insulation > Model UTP

Model	Highest Voltage (kV)	Rated insulation level			Max. Power Output per phase (KVA)	Standard creepage distance (mm)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching impulse (kVp)		
UTP-123	123	230	550	-	100	4525
UTP-145	145	275	650	-	100	4525
UTP-170	170	325	750	-	100	5285
UTP-245	245	395	900	-	333	6125
		460	1050			
UTP-362	362	510	1175	950	167	9050
		575	1300			

Gas insulation > Model UG

Model	Highest voltage (kV)	Rated insulation level			Max. Power Output per phase (KVA)	Standard creepage distance (mm)
		Power frequency (kV)	Lightning impulse (BIL) (kVp)	Switching Impulse (kVp)		
UG-72	72.5	140	325	-	75	1800
UG-145	123	230	550	-	125	3125
	145	275	650	-	125	3625
UG-245	170	325	750	-	125	4230
	245	460	1050	-	125	6125
	300	460	1050	850	125	7350
UG-420	362	510	1175	950	125	9050
	420	630	1425	1050	125	10300
UG-550	550	680	1550	1175	125	13750

Approximate dimensions and weights. For special requirements, please consult.

* For higher Rated Power values check with the factory.

For more detailed information, please visit us at www.arteche.com

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